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The Housing of Pigs

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During the twelve years from 1925 to 1937 the pig census in Northern Ireland showed a remarkable increase—from 112,412 in 1925 to 570,058 in 1937. It is quite understandable that this increase in the pig population presented problems in housing and many expedients were adopted varying from the conversion of existing buildings to the erection of entirely new plants. New buildings took many forms, from so-called Danish types to small "lean-to" sheds. Buildings adapted for housing pigs comprised, *e.g.*, the ground floor of linen mills, byres, stables and even hen houses. In such circumstances it is not difficult to realise that seldom was the health and comfort of the pigs considered; the main problem seemed to be how many pigs could be kept in the space available. Such a wide variation in types of housing was, unfortunately, accompanied by an even greater degree of variation in the standards of hygiene and management adopted.

The result was that losses amongst pigs became a serious problem on many farms and the writer of this article was deputed by the Director of the Veterinary Research Laboratory, Ministry of Agriculture in Northern Ireland, to investigate these losses and act as General Advisory Officer in connection with pig diseases. This work entailed many visits to and consultations at pig farms where losses were being experienced. In this article an endeavour is made to set down some of the points which cropped up with almost monotonous regularity.

The first of these points was the complete lack of uniformity in the system of housing; the second was the prevailing idea that pigs could be kept under any type of conditions and still be made a profitable undertaking; a third was the really intense coldness of many pig houses during the cold weather, a fact which was often commented on by the writer and Mr. H. G. Lamont, Director of the Veterinary Research Laboratory. Coughing amongst pigs was another point which could not be overlooked; in fact when one disturbed pigs in any of the larger types of pig houses one was greeted with a chorus of coughing. This, indeed, was so common that many farmers considered it to be a normal habit amongst pigs. It was a common experience, too, to have outbreaks of pneumonia reported amongst young store pigs in houses where a considerable number of fat pigs were removed at one time for slaughter. A sudden drop in temperature was often followed by serious outbreaks of pneumonia or paratyphoid in certain houses. Heat and cold, therefore, appeared to the writer to be of great importance in the successful management of pigs.

Again, too, apart from the question of disease serious outbreaks of savaging and tail-biting amongst pigs were investigated and in these cases it was found that the diet was not at fault as had been suggested, but that the houses were intensely cold and the pigs lacked bedding; at any rate these vices ceased when the pens were sheeted over, ample bedding provided and the comfort of the pigs was increased. In one instance the pigs were actually found lying on top of each other almost in tiers and fighting and tail-biting were of daily occurrence.

To test the variations in temperature occurring in pig houses thermographs were installed and proved most illuminating. A few examples are given.

1. During the 24 hours from noon on March 5th, 1940, to noon March 6th, 1940, on one farm the piggery temperature fell gradually from 68° F. to 44° F. and then rose to 64° F. The temperature of 44° F. was recorded at 6 a.m. on March 6th. The outside temperature at that time was 64° F. at noon, falling to 28° F. at 5 a.m. next day and rising at mid-day to 50° F. The pigs on that particular farm were notoriously unhealthy and were always a fruitful source of piglet influenza material.

2. On another farm on February 13th, 1940, the temperature variation during the 24 hours was from 70° F. to 44° F., while the outside temperature varied from 58° F. to 23° F.

3. A further example is taken from a well-managed Danish-type house. On February 28th, 1940, the temperature variation was from 68° F. to 50° F., while the outside variation was 67° F. to 28° F.

These examples quoted are not unusual. Greater variations probably do occur. On the other hand there are other farms where the variation in temperature is not so great but the average temperature is lower. For example, on one Government farm, although the weekly chart does not show sharp fluctuations, the temperature varied from 52° F. to 34° F. during a period when the outside temperature varied from 63° F. to 22° F. Generally speaking, the temperature of the houses was in the region of 50° to 60° F., with a rise towards mid-day and a sharp fall early in the morning. It should be pointed out that in all cases the thermograph was fixed in such a position in the house that it was not exposed to draughts and was just over the pigs' sleeping quarters, high enough to prevent the pigs damaging it.

Following up these observations, one pig farmer who was having considerable trouble with pneumonia was persuaded to sheet over the sleeping quarters of one of the pig pens and hang sacking over the open front. Temperature recordings underneath this sheeting showed an increase of up to 10° F. over the previous recordings and it was noted that the temperature variations were less abrupt. The habits of the pigs in this pen changed noticeably with this innovation. Prior to the change they had huddled together in a corner of the house away from draughts from the door. After the change the pigs spread evenly over the whole of the sleeping quarters. Later a swing door and yard were provided to this house and the comfort of the pigs was further improved.

The normal temperature of a pig is in the region of 102° F. Judging from human standards the temperature of a pig house should thus be at least 60° F. One must also take into account the fact that human beings wear additional clothes in the wintertime for extra warmth. It is not unreasonable to assume, therefore, that some additional provision should be made for pigs during cold weather.

Reasoning on these lines, another pig farmer was persuaded to treat the pens containing sows and litters in the method described. At once it was noticed that the sows took full advantage of this heating arrangement and it was common to see in the whole row of pens each sow lying inside the covered sleeping quarters with her snout projecting from under the sacking. This farmer became a convert to the idea of providing more warmth in his houses and was keen to make further experiments.

It was noticed that in houses without yards, *e.g.*, the Danish-type house, this "warming up" of the atmosphere was immediately complicated by the increased evaporation from the urine and manure so that the atmosphere became foetid and it was difficult to decide whether the increase in heat was justified by the increased contamination of the atmosphere. In order to obtain the necessary warmth without the contamination of the atmosphere it was obvious that outside runs would have to be provided. The farmer eagerly suggested that he would build a new piggery embodying all the provisions we thought necessary for a satisfactory pig house.

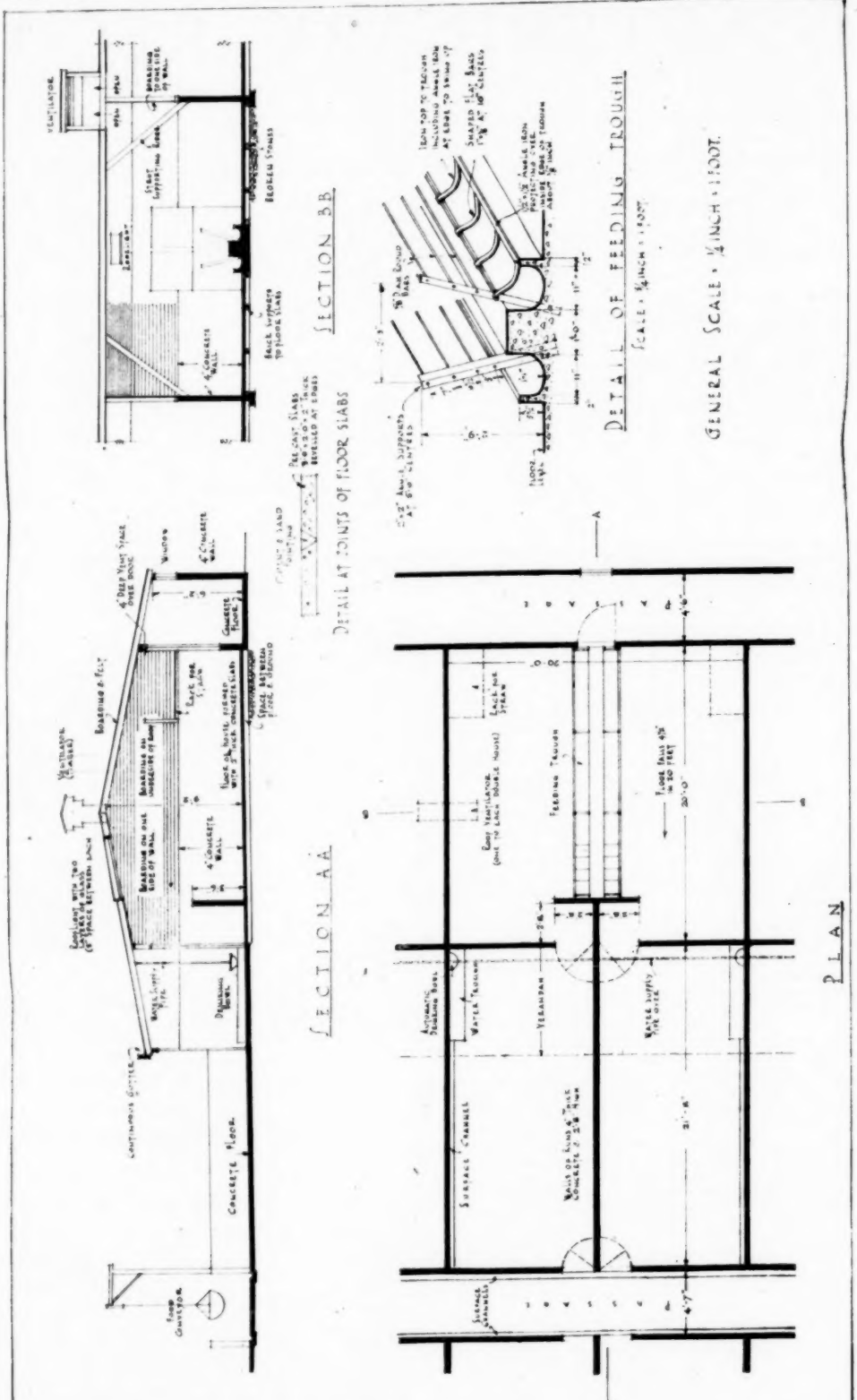
The main points to be provided for were:—

1. A suitable temperature: the temperature aimed at was about 70° F.
2. Dry sleeping quarters.
3. Suitable ventilation.
4. Suitable feeding arrangement.
5. Convenience in handling and cleaning.
6. Drinking bowls.
7. Isolation in the event of an outbreak of disease.

The following is a description of this house, which has proved eminently satisfactory. The piggery, in general, is a long, low building consisting of a series of houses each of which contains a double pen. There is an enclosed passage incorporated in one side of the building and the other side is a series of yards, one for each pen. Each house is a complete entity, being separated from its neighbour by a concrete wall built up to the roof with tongued and grooved sheeting. The roof is extended over one-third of the yards, and this, with advantage, could be extended over the whole of the yards.

The following are plans of the building, for the production of which I am indebted to Mr. A. Campbell, Board of Works Branch, Ministry of Agriculture, Northern Ireland. (*See over-leaf.*)

PLAN OF PIGGERY



Floors.—The floors of the building are of concrete. In the pens the floors are made of concrete slabs laid on brick supports so as to provide an air space under the floor.

Walls.—These are of concrete up to a height of 3 ft. 3 in. Above that the walls are made of tongued and grooved sheeting. The concrete at the lower part avoids the necessity for periodic repairs while the woodwork provides a warmer house than a purely concrete one (Steinke)[1].

Roof.—The roof is a double one, being sheeted above and below the rafters. This air space in the roof assists in the conservation of heat in the building. The roof light is also double with an air space between the outer and inner panes. Outside, the roof is covered with felt.

Ventilation.—The roof ventilator is of the Louvre type. Each ventilating shaft serves two houses or four pens. In addition to the roof ventilation the doors serve that purpose also, especially during warm weather. When all the doors in and at the end of the passage are open the current of air through the passage draws the air out of the houses. The doors into the yards can also be opened when necessary.

Feeding Arrangement.—This consists of two feeding troughs, one on either side of a narrow, raised concrete platform which separates the two pens in each house. If dry feeding is practised the meal is poured on to the concrete platform and overflows into the trough. As the trough is emptied the meal falls into the trough from the platform. Special arrangements are fitted (see detailed plan) so that the pigs cannot stand in the trough and so that meal cannot be spilled from the trough.

Doors.—The doors into the passage are shortened so that a small air space is left at the top for ventilation into the passage. The doors into the runs are half doors, the lower half being hinged to the upper half and swinging horizontally. In some cases the lower half is entirely separate from the upper half and a swing door is cut out of it, the lower part of the door merely acting as a frame for the swing door. Heavy rubber sheeting was used for the swing door and was found very satisfactory. It was necessary to make sure that the height of the junction of rubber and door was at least six inches higher than the biggest pig, since, if made smaller, the constant chaffing of the rubber against the wood perished the rubber. Rubber had the advantage that it was lighter and yielded more easily to the pig nosing its way into or out of the pen than a wooden door which had to be covered with light metal sheeting to preserve it from wear.

Drinking Bowls.—In order to keep the floors inside the pens dry the drinking bowls were placed in the yards outside the house. Small concrete channels were also made extending from under the drinking bowls to the outside of the yard to take away the overflow from the drinking bowls. This helped to keep the yards dry and was especially necessary during warm weather, when the pigs preferred to be in the yards under the protection of the extended roof. The plans show the water supply pipes to the drinking bowls outside the house and exposed to the elements. This proved very unsatisfactory during frosty weather and it would be a much better arrangement to carry the pipes along the inner walls of the pens and have only a minimum amount of piping exposed where it passes through the wall to the drinking bowls.

Removal of Manure.—There is a concrete pathway outside the runs and a door opening from each run into the pathway. The manure is brushed to this door and shovelled into a truck which is conveyed on an overhead rail to the manure pit.

DISCUSSION

One of the main difficulties in the construction of piggeries is to build a house which combines warmth with a pure, clean, dry atmosphere. The critical temperature of the pig is 68° to 73° F.[2] The temperature of the house should, therefore, not fall below that figure and, in our opinion, should be preferably higher and in the region of 80° F. even for fattening pigs. When no outside run is provided so that the pigs have to void their excreta inside the building, a temperature of 80° F. would result in a very foetid and moist atmosphere. Inside drinking bowls would add to the moisture content inside the house, which would be increased still further should wet feeding be practised.

In order to obtain a reasonably pure atmosphere in large piggeries without outside runs it is necessary to make a compromise between the temperature of the house and the contamination of the atmosphere with evaporation from the manure and urine. Numerous temperature recordings taken in such houses during the colder months of the year have shown temperatures as low as freezing point and with an average about 55° F. On the other hand, in one particular piggery where all means of ventilation were closed in order to raise the temperature to between 70° and 80° F., the atmosphere was so foetid and full of ammonia that it brought tears to the eyes on entering. Under both these conditions the animals were far from healthy. In both cases pneumonia and coughs were prevalent. In the cold houses the pigs were restless and inclined to huddle together for warmth and they were slow in fattening. Tail biting and fighting was not uncommon in such houses. In the warm, stuffy house the pigs were more unhealthy. Pneumonia was very prevalent and coughing incessant. The pigs thrived very badly.

Our object was to provide the pigs with a dry, warm house, free from the smell of excreta. To that end each double pen was completely partitioned off from the other houses; yards were provided to each pen so that all excreta was voided in the yards and drinking bowls were placed outside the house to prevent the floor inside the house from being kept damp with spilled water. In order to allow the pigs free access to the yards without excessive draughts, swing doors were provided and as an extra precaution a concrete baffle wall 3 ft. 6 in. high was built inside the house opposite the door. To preserve the heat still further an air space was left under the floor and the roof was also provided with an air space. Temperature recordings made during one week of exceptionally heavy frost showed a temperature varying from 79° F. to 81° F. during the whole period. Maximum and minimum thermometer readings were recorded in this house morning and night for over a year and during that period the maximum temperature recorded was 85° F. and the minimum 62° F. There were no sudden changes in temperature, the greatest day or night variation being 12° F.

An additional advantage of the piggery being divided into a series of double houses is that, should several pens be emptied at one time, the general temperature of the piggery is not affected. We have found this quite a serious problem on a number of occasions. The spread of influenza in pigs is limited in this type of housing. This piggery is very easily managed. One man can attend up to 1,000 pigs without any difficulty, especially when dry feeding is practised. It takes less than an hour to feed all the pigs with dry feed. Since no manure appears inside the house, the manure has only to be removed from the yards which can be hosed down afterwards. Cleaning of the houses inside is only carried out after each batch of pigs is fattened.

Piggeries with outside runs can provide far greater accommodation than those without runs. In this particular case each pen holds up to 30 fattening pigs, so that in each double house there were up to 60 pigs. With a cubic space of approximately 3,000 cubic feet each pig was provided with an air space of about 50 cubic feet and a floor space of 6½ square feet. These figures are very much lower than those suggested by Linton,[3] but in actual practice have proved completely successful: so successful, indeed, that all the other fattening houses on the farm in question were eventually remodelled on similar lines. The pig population on this farm in 1939 was 7,000.

Summary

The foregoing is a description of a piggery which appears to have several advantages over the more general type of large piggery seen in this country. The main advantages are:—

1. A dry, warm building with efficient ventilation.
2. Simple and accessible feeding trough suitable for either wet or dry feeding.
3. Accommodation for a larger number of pigs than is usually considered advisable.

References

[1] Steincke, G. (Thesis for the degree of Doctor of Veterinary Science, University, Berlin.)
[2] Linton, R. G. Veterinary Hygiene. Page 105.
[3] Linton, R. G. Veterinary Hygiene. Page 222.

One way of smuggling opium is described by E. S. Farbrother (*Ind. J. vet Sci.* (1941.) **11**. 105.). Between 30,000 and 35,000 camels are driven into Egypt every year from the East for the meat markets in the Nile Valley. From information received in October, 1939, the police detained a number of camels suspected of being opium carriers. One of the grounds for suspicion was that the owners refused £E10 "for a miserable camel not worth £E3." One of the camels detained was slaughtered, and in its rumen were found 27 containers, each 15 cm. long and 4 cm. in diameter. From 18 camels seized, over 17 kilos of hashish and 62 kilos of opium, worth about £E2,200, were recovered. To prevent the camel regurgitating the goods, the containers were weighted with lead. The hope is expressed that, to check this drug-running, stations will be equipped with an X-ray apparatus for investigating the contents of the camels' upper alimentary tract. —*Brit. Med. J.* (1942.) January 24th.

Diseases of Pigs with Reference to War-Time Conditions*

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[Mr. Powley's address was preceded by films illustrating the commercial production of liver oils and some effects of deficiency upon health and growth of pigs and poultry. The following is a summary of the address.]

As a profession we must take our share of blame for the present state of the lack of knowledge of pig diseases and realise we have for many years been dealing mostly with symptoms instead of causes.

Forced production and spread of disease move to a large extent along parallel lines and correct diet does more than any one factor to decide the health of stock. With the present restriction on the use of our usual feeding materials, the substitution of waste products, many of them processed, combined with permanent housing, one would expect to meet an increase in disease problems. If the food intake is deficient in any essential factor or factors, sooner or later a state of malnutrition will be induced with the various resulting disease syndromes.

In malnutrition due to dietary deficiency, the deficiency is seldom single, or in other words single avitaminosis arises from multiple deficiencies. As we know, vitamin A and iron are stored in the liver. The young pig has a limited capacity for storing up vitamin A from the maternal supply with the result that an efficient post-natal supply is essential for the maintenance of health. As to iron, if the pre-natal liver supply is short the dam cannot supply it through the milk to maintain the health of the offspring. In the case of minerals it has been found that a continuous deficiency may not be apparent in the offspring at the first or even the second pregnancy. This is a most significant fact and must be carefully borne in mind when investigating pig disease problems, particularly in breeding establishments, otherwise the long continued but unsuspected deficient mineral intake will be overlooked and the troubles ascribed to some recent change of diet or treatment. Deficiency of vitamin A and calcium both produce nervous symptoms with paralysis supervening. The close relationship between deficiency and infection must be emphasised and is well illustrated in the confusing pneumo-enteritis conditions encountered in young pigs.

A large percentage of pig disease problems are related to the management and diet of the breeding stock and their offspring. The beneficial effect on rearing problems of adopting the outdoor system is now well understood. Nature endowed the pig with a snout with which to grout in the soil, thereby obtaining essential minerals and other substances to maintain health; outdoors also is administered the beneficent sunlight.

In our civilised way we try to rear the pig under artificial conditions in buildings devoid of direct sunlight, open to extreme ranges of temperature (which the pig's economy cannot simply tolerate) on so-called balanced rations—often devoid of vitamins—and are then surprised when disease rears its head.

The accompanying chart is drawn up with the idea of making this talk clearer and applies only to pigs reared entirely in sties without access to pasture or soil; in other words, to pigs reared under artificial conditions.

For purposes of convenience and clarity the diseases have been divided into those of unweaned and weaned, but of course the list does not include all the diseases to which the pig is liable.

Of the diseases affecting the unweaned the nutritional anaemias are of paramount importance because if not treated there follows a train of disease in the weaned pig, classified in the second column under the headings 1, 2, 3 and 4.

As to 4 (rachitis), attention is called to the tetany which is occasionally seen in fat, healthy-looking pigs at about seven to eight weeks old which come racing to the trough, bury their snouts in the food, suddenly throw up their heads and fall to the ground in a tetanised condition. Some will die off hand and those which recover from the tetanic spasms will eventually, in the course of a few weeks, show enlarged joints and evidences of rickets.

No. 3, in the unweaned column and 1 (*c*) and 5 in the weaned column are all due to the same pneumotropic virus with various secondary invaders.

In the case of 5, the feeding period is extended by at least five to six weeks, with the consequent loss of food and labour, important factors these strenuous days.

Weaned

1. Pneumo-Enteritis
Pre-disposing factor, lack of anti-infective vitamin A which promotes the growth of epithelial layers of all mucous surfaces.
Pneumonia
(*a*) Swine plague (*Pasteurella suiseptica*). Questionable whether single uncomplicated suiseptica infection occurs in this country.
(*b*) Enzootic pneumonias.
(*c*) Swine influenza (pneumo-tropic virus). P.M.: Grey hepatisation of apical, cardiac and intermediate lobes.
Enteritis
Necrotic enteritis. Seen any time after weaning where overcrowding and unsanitary methods obtain. Results from heavy and repeated doses of *Salmonella suipestifer*.
Note.—Healthy anaemic and vitamin depleted pigs are equally susceptible to *S. suipestifer*.

2. Arthritis
Running on to polyarthritis at from 10 to 16 weeks old. *Polyarthritis* usually associated with *Erysipelothrix rhusiopathiae*.

3. Polyserositis
Usually associated with (2). Analogous to and *post-mortem* changes comparable to those seen in acute rheumatism in children.

4. Rachitis
Seen in piggeries where food mixture is deficient in calcium and phosphorus with lack of vitamin D. True rickets practically never seen in piggeries where a good feed ration is used with ventilation and light adequate. Mostly seen in cottagers' pigs. (Tetany.)

5. Swine Influenza
Pneumo-tropic virus with complicating secondary organisms.
Affects pigs 8 to 14 weeks old. Chronic type encountered in fatting pens where persistent cough is the chief symptom. P.M.: Grey hepatisation of apical, cardiac and intermediate lobes. An occasional fat pig dies from broncho-pneumo-enteritis.

6. Deficiencies
† (*a*) *Vitamin A.*—Inappetence, cessation of growth, catarrh of mucous membranes, particularly alimentary and pulmonary. Impairment of vision, abnormal gait, convulsive fits and nervous collapse.
‡(*b*) *Calcium.*—Anorexia, unthriftiness characterised by emaciation and rough coat, unsteady gait leading to posterior paralysis, cessation of growth, poor utilisation of food.

7. Parasitism
(*a*) *Ascaris suilla.*—Note: One type of pneumonia ascribed to lung penetration by massive numbers of larvae.
(*b*) *Verminous Broncho-pneumonia.*—Of particular interest on account of causal para-ite being occasionally incriminated in outbreaks of swine influenza.
(*c*) Trichiniasis.—Several outbreaks recently recorded in humans in the medical Press.

† *The Journal of Agricultural Science.* Volume XXIX. Part 1. Jan., 1939.
‡ *The Journal of Agricultural Research.* LXII. May 1st, 1941. p. 541.

Unweaned

1. Diseases of newly-born Pigs
E.g., Hairless pig malady of U.S.A. (iodine deficiency). Very common in some iodine deficient soils in Canada and U.S.A. Have only encountered one outbreak in this country.

2. Nutritional Anaemias
(*a*) *Iron Deficiency.*—Characterised by white scour at three to six weeks old with skin pallor. Associated with copper and cobalt deficiency. Readily amenable to individual dosage with iron.
(*b*) *Vitamin A Deficiency.*—Usually concurrent with (*a*). Cod-liver oil and green fodder corrects.
So-called grass juice factor may have an important bearing on the anaemias.

3. Piglet Influenza (Ferkelgrippe)
Due to pneumotropic virus with complicating secondary organisms, chief of which is *Haemophilus influenzae suis*.

4. Acute Arthritis (*H. influenzae suis*)
Lameness, joint swellings, high temperature, etc. According to Lamont and Shanks, M and B 693 is a specific.

Infectious Diseases

1. Virus Swine Fever
Treatment—antiserum in sufficient dose followed by exposure to infection. Sucking pigs are generally immune whilst sucking immune sows, but lose their immunity near or after weaning. Probably explained by the fact that antibodies are transmitted to the offspring by the colostrum. Crystal violet vaccine reported to show great promise.

2. Swine Erysipelas
Give double vaccine after weaning. Do not wait until disease appears.

3. Foot-and-Mouth Disease
Always examine feet carefully in case of lameness for signs of vesication round coronary band, between claws, bulb of heel and supernumerary digits, particularly if several pigs fall lame simultaneously and lameness progressive through the pen and herd.

*Presented to the meeting of the Central Veterinary Society (Division, N.V.M.A.) held at the Conway Hall, Red Lion Square, London, W.C.1, on February 12th, 1942.

DISCUSSION

Professor W. C. Muller: In accepting the invitation to open this discussion I was conscious of three things: first, the honour, to which due attention must always be paid; second, the difficulty of the subject; and thirdly, a responsibility which the profession has to the public to do all that it can to aid in the increasing home-produced foods.

I would like to feel free to put some ideas forward without reference to what you have just heard so admirably from Mr. Powley, whose interest in pigs has always been great, and whose knowledge and experience of pigs and methods of pig-keeping is very extensive.

Since war began, we have seen major changes in pig-keeping and pig feeding. The activities of the National Pig Breeders Association and especially of Mr. Cedric Drew and the energetic secretary, Mr. Alec Hobson, have brought into being over 2,000 new pig clubs under the Small Pig Keepers' Council, and very many of the members of these clubs have had no previous experience of feeding pigs. There have been troubles and there will be more troubles, doubtless, in the activities of these clubs, but on the whole a great measure of success has attended their efforts. It is perhaps fortunate that these clubs are engaged in *feeding*, not in *breeding* activities, for if breeding had been allowed by the Council the mass of trouble would have been much greater.

This brings one to a point of some importance. Provided a litter of pigs is well reared under good conditions, up to 12 or 15 weeks of age, it is remarkable how well and for how long pigs will withstand poor and unsatisfactory conditions subsequently before showing any clinical signs of illness. Similarly, the converse is true. A poor start in life means that pigs will suffer more seriously and much sooner than otherwise. So that where possible, it should be our duty to advise inexperienced pig club members to obtain their store pigs from sources where the systems of breeding and management are on the best lines. I fully agree with Mr. Powley when he says that outdoor systems of rearing are far superior to the indoor; and that the more natural and less artificial the methods of rearing are, the healthier will be the pigs. The emphasis should be upon *fresh* living foods rather than upon artificial vitamin, protein or mineral or other artificial supplements.

A second major change that has occurred is the change from an almost free choice of pigs foods as in pre-war days, to a very restricted choice—indeed, to haraly any choice at all. The breeder suffers here more perhaps than the small feeder. One result has been that where general farming products are available, pigs get a bigger share of home-produced foods than before and benefit accordingly, but where the pig-owner must buy practically all he feeds on the market, he has no control of quality and very little of quantity, and without a reinforcement by natural foods —grass, clover, green or succulent foods, etc.—breeding sows suffer. Then thirdly, prices have gone up. Fish meal, one of the most valuable readily available foods for ensuring adequate mineral intakes and good quality protein in peace-time, has becomes more than two and a half times its peace-time price, and supplies now are very limited. A farmer must think twice before adding say 10 or 12 per cent. of fish meal to an otherwise cereal meal mixture for young pigs, when he is paying round about £25 per ton for it, and gets only irregular supplies. It seems a pity that Government did not take steps to build up a reserve store of fish-meal in peace-time, for use in emergency, such as was suggested to them; for an adequate supply would have been of great value now for calves, poultry and breeding females of all species as well as pigs.

A further change worth noting is the result of the work supervised by the Pigs Experiments Co-ordinating Committee, whereby many trials at different centres have been carred out to find out whether some modification or extension of the Lehmann System was applicable to British conditions. This work shows that under reasonably average conditions in this country, pigs can be satisfactorily fattened by giving them a basic ration of some 2½ lb. of concentrated meal mixture, and allowing them to eat enough to satisfy their appetites, of a large variety of more or less natural foods. The list is a long one and includes such foods as potatoes, mangolus, sugar-beet tops, cabbages and kales, grass, clovers, cut and fed green, lucerne, and so on. The chief results obtained show that the method can be satisfactorily applied in this country, that there is a saving of anything from 1 to 1½ cwt. of meal per pig, although perhaps at the expense of time (up to four or five weeks longer to fatten) and of carcase proportions (heavier but better bony framework, and a lower killing percentage live to dead weight). The disadvantages however are more than outweighed by the advantages, in time of war, and the system of fattening upon which the issue of coupons is made to the pig clubs is a modified Lehmann system.

I am glad to see from the chart that Mr. Powley has differentiated between diseases and ailments of piglets—pre-weaning—and those which normally occur post-weaning. Some conditions, such as swine influenza, swine fever, etc., occur in pigs of almost any age, but usually even in them there is a distinctly different clinical picture, the younger pigs being affected more acutely. While this way of differentiating is very useful, clinically, it must, I think, be remembered that many diseases which are manifested most typically in pigs after weaning, have their basic causes in errors of management and feeding during the sucking period or even while the sow is pregnant.

So far I have dealt with generalisations: I would like to raise one or two more specific points—some of which have already been mentioned by Mr. Powley.

Swill Feeding.—There are all sorts of swill and several ways in which it is used. I think that perhaps too much has been expected from use of swill for pig-feeding in war-time, and it has, I know, given disappointing results in the hands of some feeders, especially the inexperienced amateur. Swill for pigs is, of course, not a purely war-time measure; it has been used for almost as long as the pig has been domesticated. The difference between peace-time and war-time use is largely that in peace it was the make-weight or extra part of the ration, while in war it is being used to form a far bigger proportion of the ration—up to 66 or 75 per cent. or more of the total food intake, and from time to time we hear of pigs fattened "entirely on swill."

It is desirable first of all to consider what swill is. There are typically four main kinds:—

Fresh household swill—summer and winter types;
Processed " " " " ;
Camp (military) swill (meat-rich or ordinary);
Dried balanced swill.

The first essential is to ensure that inedible substances such as paper, string, all metal objects, ashes and so on, and all harmful food residues, tea leaves, citrus fruit rinds, stones from stone-fruits, bones, etc., are removed, and the next most important single factor is to ensure that the swill is collected daily so that it will not be sour.

Residue consisting entirely of vegetable matter is probably best fed untreated, if it can be ensured that it is not contaminated or adulterated in any way. In practice, this is only possible when the household providing the fresh swill feeds its own pigs; swill collected from outside sources is almost certain to be contaminated sooner or later.

All swill containing refuse of animal origin must be boiled for one hour (Boiling of Foodstuffs Order 1940) as a check upon the spread of foot-and-mouth disease, and the responsibility for ensuring this is upon the pig feeder. It is to be feared this is not always carried out. One of the most successful men, who uses large amounts of swill from a large public institution, finds that by boiling or simmering the day's collection for 10 or 12 hours with a minimum amount of water he gets a more or less uniform thick porridge-like mass, from which any excess fats can be readily skimmed off, and which mixed with meal forms a much more attractive and palatable food than by boiling for only one hour. Moreover, fibrous matter is softened and broken down so that young pigs of 50 lb. or less can eat it without harm. I may mention that the young pig is notoriously unable to digest large amounts of crude fibre and where such is fed to pigs under 80 or 90 lb. live weight, indigestion, lack of appetite and especially constipation are common and may be serious.

Prolonged boiling probably results in a sacrifice of much of any pro-vitamin A content (from green vegetables, carrots, etc.) there may be and reduces the essential amino-acid content of the food, but apart from the higher cost of fuel, there is much to recommend it. It is better fed rather dry than too sloppy and clean water should be given to drink between meals.

Pigs of 80 to 100 lb. live weight and upwards benefit greatly from a daily supply of a few pounds of any green fresh garden or allotment vegetable residue present in fresh swill—potato, carrot, swede, parsnip, apple or other similar peelings, leaves of the Brassica family and so on, while failing other green food a handful or two of lawn cuttings is quite useful. It is difficult to assess in precise terms the value of these; they contain minerals, some carotenoids (precursors of vitamin A), some vegetable proteins and so on, but they have a beneficial effect greater than their analysis would suggest. It is possible that some of this extra value is due to the gently laxative effect on the bowels, and some to the presence of plant auxins in the tissue juices. It has been noted that the efficiency of digestion of cereal meals increases when fresh foods are added to the ration, and decreases when they are removed.

Regarding the use of the various dried swills from large centres of population, I am afraid I am not very enthusiastic. I fully realise that the use of these is now being widely advocated, and that they should constitute a valuable addition to pig foods in war. Analysis on paper of an average sample, dried and balanced, is given by Woodman as dry matter 89·7 per cent.: protein 24·8 (P.E. 15·9); fat 10·9 (8·9); soluble carbohydrate 29·8 (19·2); fibre 7·8 (3·6); ash 16·4. (Figures in brackets are the digestible percentages, except protein.) It may be that others can speak of the successful use of these but I find myself in a difficulty in advocating them.

Harmful effects which may result from use of swill are capable of being divided into two classes; those from wrong usage, and those due to harmful substances in the swill. Wrong usage is nearly always either feeding swill to pigs too young to digest it, or feeding far too large amounts per day. As mentioned, the young pig does not make good use of fibre and it is better withheld or only given in very small amounts until the pig is at least 75 or 80 lb. weight. Thereafter, it should be increased gradually until at 150 lb. or so the pig is eating about 10 to 12 lb. of the wet swill which should be equivalent in feeding value to about 2½ to 3 lb. of meal. If the pig begins to show a hardening of its dung, has difficulty in defaecating, or goes off its food, failing to clean up its trough in 20 to 30 minutes, the amount should be reduced. Any noticeable grunting or groaning when the pig is lying undisturbed and at rest, is a premonitory sign of abdominal discomfort and often associated with too much indigestible fibre in the diet. Stiffness on rising, and staggering for a step or two on coming to the trough, are also frequently associated with indigestion of this nature. A suitable dose of sodium sulphate in treacle-water or salt and water given early is a very useful corrective, but if constipation is in existence and especially if there is any sign of jaundice in the sclera of the eye, as there often is later, I think the rather old-fashioned 10 to 20 grains of calomel made into an electuary with treacle or syrup is hard to beat.

One of the difficulties that I would like to ask Mr. Powley to clarify is that of differentiating between a simple, even though severe, indigestion caused by bad feeding and the early pre-diarrhoea stages of necrotic enteritis, specific or non-specific. The only suggestions that seem helpful are that usually there is a higher temperature and more abdominal pain with necrotic enteritis, especially when due to *Salmonella* infection, and that when feeding is responsible it is usual to get most of a batch of pigs affected, whereas necrotic enteritis goes through a batch, starting in one or two and spreading fairly rapidly to others. These latter are, however, not helpful when only one or two pigs are kept, as is so common at present in urban areas.

When some harmful agent is present in the swill there may be vomiting and acute diarrhoea and one or more pigs, but seldom all of them, are involved. I believe the President has had one or two interesting cases of this nature and perhaps he will give us details.

I have not touched upon the more specific diseases but may I perhaps underline and emphasise one or two points. In practice, it is seldom that pure uncomplicated single deficiencies arise, and it is perhaps as well to remember this when considering the signs and symptoms of experimentally induced vitamin or mineral deficiencies, such as the films show. The great rule to remember is that when a deficiency or series of deficiencies is encountered in the field, it is necessary to examine the whole of the ration and the management and make sure that any suggestions made provide an adequacy of all food substances, not forgetting even trace elements such as iron, copper and cobalt. I have heard of one practitioner who successfully uses arsenic as a trace element—its action is possibly catalytic, which after all is probably the chief function of most vitamins and all trace elements—in his mineral mixtures. He gets better results with it than without.

I would like to emphasise the great need to keep the breeding stock and the young pigs up to weaning at least under as nearly natural conditions as possible. Both the pig-fold system and the sow tethering systems are excellent and far superior to rearing indoors under hothouse or semi-hothouse conditions, even in winter. Provided the sow is well-fed, adequate bedding is given, shelter from direct draughts is provided and the little pigs lie dry at night, they will withstand almost any kind of weather we get in Britain if they are of good hardy stock. The benefit of fresh air, exercise, access to living foods and the soil gives the litter a start which enables it to thrive under conditions which kill weaker indoor-reared stock, and if we can urge more natural rearing methods whenever possible we shall be doing a very great service to the future of the pig industry of this country.

In conclusion, I would like to ask Mr. Powley one or two particular questions. Does he attach any diagnostic importance to a small yellowish or greyish bead of muco-purulent material at the inner canthus of the eyes of young pigs? Personally I do not think I have ever seen it except in cases of swine fever. It is not unlike the similar condition in the dog with distemper. Has Mr. Powley ever encountered necrotic enteritis, or pneumo-enteritis, in pigs fed on a ration including 3 to 5 per cent. of dried yeast? I ask this because several times I have noticed that the addition of yeast (usually dried brewer's yeast) to the rations of young pigs between weaning and 15 weeks of age resulted in an immediate cessation of further cases of illness and recovery in those which had not already progressed too far. The reason for giving it is of course that it is a good cheap source of most of the vitamins of the B complex and it contains some A and C as well. Further, it has a useful content of protein (P.E.40) of fairly good biological value.

I should like to thank Mr. Powley for the trouble he has taken to prepare such an excellent address and demonstration, and may I say that I think his chart should do much to clear up the confusion into which many of us have been plunged over the question of the diseases of young pigs.

Dr. Stableforth referred to some of the work they were doing at Weybridge on swine fever and necrotic enteritis, expressing the hope that two of his colleagues who were present would amplify some of his remarks.

As regards swine fever, they had been trying to find a method of diagnosis which would enable accurate diagnosis to be made early in the disease. Although the clinical and epizootiological characters of acute swine fever were well known there was often difficulty in giving an early diagnosis, particularly in subacute outbreaks. The possibility of using various small animals had been tested and they were now studying serological methods for the purpose. Attempts to produce a modified

virus by brain passage for vaccination purposes had also been made but had now been dropped in view of Mr. Doyle's very promising results with crystal violet vaccine.

As regards necrotic enteritis, they were studying the effect of bacterial, dietetic and environmental factors on the development of the disease. The name necrotic-enteritis was itself a reflection of the pathological lesion, *viz.* necrosis of the bowel, and this lesion could be produced by more than one agency: it was produced by *Bact. suipestifer*; it could also be produced by a deficiency of vitamin B_2. The bacterial disease was better referred to as paratyphoid infection. During the past year they had established a suitable experimental dose of *Bact. suipestifer* and had used this to assess the importance of vitamin B_2 and the value of several therapeutic agents.

Dr. G. Slavin, in amplification of Dr. Stableforth's remarks, gave a survey of the necrotic enteritis work which has been going on at Weybridge for some years, saying that, since in previous work very large doses of culture were used usually under artificial conditions, he devised a method of infection which resembled closely natural conditions and, to meet future criticism, good pigs under good conditions were used. Breeding stock and experimental pigs were fed on a good quality balanced ration and always had ample grass at their disposal. Their nutritional status was presumably at the optimum. The method of infection was to spray lightly the grass of a new pen with broth culture of *S. suipestifer* just before the newly weaned pigs were placed in it. The pigs became infected by eating the grass. Typical necrotic enteritis could be produced in this way. While the experimental work was proceeding as many field outbreaks as possible were examined in detail. Not less than two typical cases of the suspected necrotic enteritis were removed to the laboratory for detailed examination and material from these pigs together with as many blood samples as possible from sick pigs on the farm were inoculated into susceptible test pigs to exclude swine fever.

When it had been established that typical necrotic enteritis could be produced as required, a number of experiments were made to obtain further information. It was found that pigs could be infected by contact during the early stages of an outbreak and by placing them on ground vacated a few hours previously by recovered pigs. A few vaccination experiments were carried out and although the numbers were too small to be conclusive the results were not encouraging. Vaccinated pigs seemed to be more resistant than unvaccinated to septicaemia but not to bowel infection. There was no significant difference in weight gain between vaccinated and unvaccinated pigs. "There is a widespread belief that faulty nutrition is the principal cause of necrotic enteritis," said Dr. Slavin. "The experiments just described were designed to demonstrate that pigs with adequate nutrition were susceptible to infection."

For specific nutrition and other experiments it was impossible to work under natural conditions because each pig had to be given a standard dose of culture under controlled conditions. A number of experiments were first made to test the effect of graded amounts of culture. Pigs were divided into groups to give even litter and weight distribution. The pigs, in sties or in grass pens, were starved for 24 to 36 hours and given the dose of culture in the food. It was found that a single dose as small as two million *S. suipestifer* would cause definite infection. Probably even smaller numbers would be effective. The difference in weekly weight gain as compared with non-infected controls was striking. Mortality and clinical signs were not of great importance and the only true test of the result of the infection was the performance of the pigs as shown by weight.

Because of the resemblance of pig pellagra to necrotic enteritis the view was widely held, principally in America, that nicotinic acid deficiency was the cause. An experiment with 36 pigs divided into six groups was therefore planned, the effect of infection with *S. suipestifer* at eight and twelve weeks on deficient and non-deficient pigs being tested, with uninfected deficient and non-deficient pigs as controls. No significant effect of nicotinic acid deficiency on susceptibility to infection was found and he hoped they had finally disposed of that theory. With regard to Professor Miller's statement on yeast, he could assure him that their pigs had adequate yeast in the ration.

The value of a number of chemotherapeutic substances had been tested. M & B 693 and M 371 (4, 4, diaminodiphenylsulphone) were without effect but sulphaguanidine was very successful. In the first experiment with sulphaguanidine two groups of 10 pigs each running together at pasture, were infected. One group was treated for five days with sulphaguanidine, starting 24 hours after infection. One week after infection the treated pigs had gained a total of 50 lb. and the untreated pigs had lost a total of 35 lb. The difference faded out in succeeding weeks as the untreated pigs recovered naturally. Three treated and one untreated pigs died. A second experiment with much smaller doses of sulphaguanidine gave similar but less striking difference between the groups but the experiment was complicated by extremely cold weather which possibly affected the progress of the treated pigs.

Mr. R. O. Muir said that as one of "the young colleagues who still grope amongst swine fever bowels," mentioned by Mr. Brown in his "Ode to Swine Fever," he would like to supplement Dr. Stableforth's remarks on their work on swine fever research at Weybridge. When he first arrived there and was informed that he was assigned to research work on swine fever diagnosis and prophylaxis, he had visions of lovely button ulcers in the large intestine as illustrated in the textbooks and thought the part of the work regarding diagnosis should be plain sailing. However, during subsequent routine *post-mortem* examinations of experimental swine fever cases, he became rapidly disillusioned, for in a large majority of the bowels of these pigs, the button ulcer was conspicuous by its absence. To illustrate the extreme difficulty of diagnosis in the field (although he had had very limited experience in that sphere and must refer them to Mr. Brown for confirmation of his allegation) let him quote one of several similar instances where carcases were sent to them from a tenacious outbreak of disease amongst pigs where no lesion, regarded as diagnostic of swine fever according to the Diseases of Animals Acts and Orders of the Minister of Agriculture and Fisheries, could be found over a period of several months. Organ suspensions from these pigs were injected into healthy pigs which were kept in isolation pens together with healthy contacts and by this means the outbreak was definitely diagnosed as swine fever, since numerous button ulcers were found in both the injected and contact pigs at autopsy. Of course, this method of diagnosis was altogether impracticable owing to the expense involved in the purchase and maintenance of the test animals.

Attempts were made to find a less costly method of diagnosis. A fully virulent strain was administered, in the form of desiccated spleen suspension or whole blood, to groups of mice, hamsters, white rats, guinea-pigs and rabbits by every possible variation of route. No clinical symptoms were observed in any of the species mentioned. The possibility of a histological method of diagnosis was also investigated by examination of the brains of intracerebrally inoculated animals, in the enumerated series of species, which had been killed at daily intervals after injection. Distinct reactions were observed in the brains of mice, white rats, guinea-pigs and rabbits, but their significance was complicated by similar if less marked reactions in the brains of control animals which had been injected intracerebrally with material from normal pigs. Two of his colleagues had investigated the possibility of diagnosis by serological methods and by attempted culture in chick embryos, but so far without success, serological methods being complicated by the presence of non-specific protein in the antigenic suspension and non-specific antibodies in the antiserum. Here a method of concentration and purification of virus might be of value.

With regard to the prophylactic aspect of their research, attempts had been made to passage the virus through the brains of suitable experimental animals, with a view to obtaining a neurotropic strain. Results were disappointing, since the virus could not be recovered after the second or third passage and there was no evidence of multiplication. The work was discontinued in view of the promising results obtained with crystal violet vaccine. The work done by Iacotot, Vechiu and Zichis, on the transmission of the swine fever virus to ruminants, all independently, led them to determine the duration of survival of the virus in the goat and whether it could be subjected to intracerebral passage. The virus was recovered from the blood of a goat eleven days after intravenous inoculation and was passed intracerebrally through seven goats without modifying its virulence for the pig.

In reply to Dr. Hare, who asked if the virus could be recovered from the urine, Mr. Muir said that the urine was not tested for the presence of virus, but this would be a useful line of research with a view to ascertaining the possibility of ruminants acting as carriers of the virus. Indeed, such experiments had been envisaged as well as the investigation of possible methods of purifying and concentrating virus, but the war programme of research work had necessitated postponement of the experiments planned.

Dr. McEwen expressed his thanks to Mr. Powley and Professor Miller, saying that what had gratified him most was that both had emphasised the supreme importance of nutrition and husbandry. He had always felt that there were few infectious diseases of the pig and that many of its diseases were caused through bad husbandry. Mr. Powley had shown how many diseases were associated with anaemia in early life. Some years ago he encountered necrotic enteritis in animals at a pig nutrition station and this disease was there so associated. The pigs that died from the necrotic enteritis were not infected with *S. sui. estifer*. The disease closely resembled the deficiency disease of pigs described by Martin and his co-workers at Cambridge, but the latter disease was prevented by feeding nicotinic acid. The disease that he met was obviously of different aetiology as the pigs were bedded on straw which they ate and a diet containing straw was not deficient in nicotinic acid. The necrotic enteritis at this station was a disease of the winter months, but it disappeared when the nutrition of the young pigs was corrected and they no longer suffered from anaemia.

Mr. Esmond Brown observed that Mr. Powley had told them that years ago they knew little about pig disease and merely treated symptoms. A look at his chart showed them a lot of new names, but he did not think names put them very far forward. Apart from foot-and-mouth disease and anthrax, which were not special to the pig, there were only two diseases, swine fever and swine erysipelas; the others were all matters of faulty hygiene. A great deal of the work received from the laboratories was most interesting, but the results had a way of failing to repeat themselves under field conditions.

Dr. Tom Hare emphasised the importance of coccidiosis, lung-worms and bowel worms, the incidence of which was increasing. The increase was due to over-stocking or to "pig-sick" pastures and was not correlated with any deficiency disease among sows and sucklings. Nutritional anaemia had been successfully combated by keeping sows and the litters on range; but owing to war-time practices rotation of the sows over the land was not possible now on most farms. It would be a mistake to return to farrowing and rearing indoors which led to nutritional deficiencies. The solution appeared to lie in obtaining permission of the County War Agricultural Committee for the ploughing up of parasite-infested pasture and returning a comparable acreage of arable to grass or leys for the sows. The sows should be cleared of parasites before they were put on the clean land and for that purpose the powders containing the three sulphates of nicotine iron and copper, or possibly phenothiazine, should be used for the worms; while Syr. Ipecac. Co. should be given for coccidiosis. Microscopical tests of the faeces were an essential control of treatment.

The President (Mr. H. E. Bywater) pointed out, for the information of those who were not familiar with swill, that it was not now so valuable a food as it was before the war since it now contained practically no meat or fish scraps. The only swill that was now of high feeding value was that obtained from army sources and to a less extent that from institutions. Household waste and so-called "swill pudding" was composed mostly of cabbage leaves and potato peelings. Local authorities in London were not encouraged to use raw household waste for feeding direct to pigs but urged to send it to be dried and mixed with protein rich products to make into balancer meal for poultry and to a less extent for pigs. A great deal of experience was necessary to feed pigs successfully almost exclusively on swill but where it was so used it gave good financial returns.

The Reply

Mr. Powley said that he was very grateful indeed to the speakers for the manner in which the discussion had been conducted, in that instead of attempting to pull the talk to pieces they had amplified it. Professor Miller mentioned the Lehmann system and he (the speaker) rather anticipated that he would say something about ensilage as some farmers found ensilage an excellent supplementary winter food for breeding sows and young pigs. Professor Miller also mentioned the use of yeast in connection with acute enteritis. Experience, however, would not appear to give it the credit claimed. It was obvious that if one was going to raise one's pigs in smaller and more crowded runs, one was going to increase the risk of parasitism, and this was borne out by practice. The best thing to do was to adopt the Maclean's system with the sows and worm the stores before putting them in the fatting pens.

There were many other points mentioned in the discussion but the lateness of the hour suggested that he must bring his remarks to a close.

SHORTER MEDICAL STUDIES: G.M.C. NOT TO OBJECT

The General Medical Council considered on Saturday a report from its joint Education and Examination Committee on a recommendation from the Minister of Health that the period of medical study might be shortened as an emergency measure.

The Council decided that it would not stand in the way of any licensing body which cared to shorten the period of medical study following the examinations in anatomy and physiology, provided that at least 30 months were allowed between these examinations and the final examination, and that the standard was not lowered. At the present time the minimum period is three years.

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Weekly Wisdom

I cannot undertake to predict what decision may be reached at some future date in circumstances which it is at present impossible to foresee.—The Home Secretary, House of Commons, June 2nd, 1942.

THE VETERINARY RECORD
JUNE 13TH, 1942

FARM LIVESTOCK EMERGENCY SERVICE

MEMBERS of the Profession will be glad to see, reproduced below, the notice issued by the Ministry of Agriculture and the Secretary of State for Scotland referring to a Farm Livestock Emergency Service. Although in the notice it is stated that the Farm Livestock Emergency Service should be devised and administered by an Executive Committee, we understand that in the first instance the service created by the Rural Areas Committee of the National A.R.P. Animals Committee will be taken over and re-organised on an official basis. It is hoped that all Veterinary Officers of this A.R.P. Animals Service will be willing to assist the new body and that they will be able to retain the help of their Animal Stewards. The Service envisaged is to remain a voluntary one, but out-of-pocket expenses of veterinary surgeons will be defrayed. Under new official decisions, fees for veterinary treatment of animals injured by enemy action can be included in the claim for war damage whether or not the animal recovers.

A representative executive committee has been established, and it is pleasing to note that the Duke of Beaufort has been appointed its Chairman. In view of this and the fact that the new Service will be official, it is to be expected that many of the difficulties inherent in the previous scheme organised by the National A.R.P. Animals Committee, will disappear.

A point worthy of note in connection with this new Executive Committee is that the National Veterinary Association was asked to nominate representatives for the Committee, and the profession will be gratified to know that the Association nominees have been accepted by the Minister. On this page reference is made also to the fact that the Association has similarly been requested to nominate a representative to a committee recently established by the Ministry of Agriculture to supervise the field experiments now being conducted on the control of swine fever. Mr. Male, M.R.C.V.S., of Reading, has been appointed and is already acting on the committee. It is primarily as evidence of more effective co-operation between the Government and the profession that these practical signs of greater understanding between them will be welcomed.

FARM LIVESTOCK EMERGENCY SERVICE

SCHEME FOR ANIMALS OFFICIALLY RECOGNISED

Following is the text of the notice issued by the Ministry of Agriculture and the Secretary of State for Scotland in reference to the establishment of a Farm Livestock Emergency Service, to which reference is made in our Editorial column.

1. In order that farm animals injured in air raids or through other war operations may receive prompt treatment or be slaughtered without delay and salvaged for human food, a suitable scheme, to be known as the Farm Livestock Emergency Service, should be devised and administered by an executive committee.

2. The Executive Committee shall be appointed by the Minister of Agriculture and Fisheries and the Secretary of State for Scotland after consultation with the Minister of Food. It shall consist of two members of the National Veterinary Medical Association of Great Britain and Ireland (one of whom shall normally be resident in Scotland), one member each of the National Farmers' Union and the National Farmers' Union and Chamber of Agriculture of Scotland, and one representative each of the Ministry of Agriculture and Fisheries, Department of Agriculture for Scotland and Ministry of Food. There shall be an independent Chairman appointed by the Ministers.

3. The following shall immediately form the Executive Committee and shall hold office at the pleasure of the Ministers :—

Duke of Beaufort ...	Chairman.
Dr. W. R. Wooldridge Dr. Alex Robertson ...	National Veterinary Medical Association.
Mr. George Gibbard	National Farmers' Union.
Mr. W. Graham ...	National Farmers' Union and Chamber of Agriculture of Scotland.
Mr. R. H. Franklin ...	Ministry of Agriculture and Fisheries.
Mr. L. C. Davidson ...	Department of Agriculture for Scotland.
Mr. A. W. Anderson	Ministry of Food.

4. The Executive Committee shall devise and administer a scheme for the treatment or slaughter of farm animals injured in air raids or through other war operations. In particular, they shall :—

(i) Organise and maintain on a voluntary basis a corps of veterinary practitioners and parish animal stewards who should be prepared to deal with injuries to farm animals arising from operations connected with the present emergency.

(ii) Establish a small headquarter's staff to undertake and supervise the arrangements for such a body of voluntary workers.

(iii) Arrange for the salvage and sale to the Meat and Livestock Organisation of the Ministry of Food of the carcases of any animals injured or killed as a result of enemy action which are suitable for human food.

(iv) Provide, where necessary, essential equipment, such as humane killers.

(v) Repay in appropriate cases out-of-pocket expenses of veterinary surgeons in connection with their initial service in respect of injured animals.

5. Grants not exceeding £5,000 per annum will be made from Government funds to meet the net requirements of the Service after deducting such other monies as may be provided for the purpose by the agricultural industry.

R. S. HUDSON,
Minister of Agriculture and Fisheries.
THOMAS JOHNSTON,
Secretary of State for Scotland.

Swine Fever Vaccine Field Trial

The Ministry of Agriculture has set up a committee, with Major T. Dalling as Chairman, to arrange and carry out a field trial with the crystal violet swine fever vaccine which has been the subject of research work at the Weybridge Laboratory and which was first devised in America. The National Veterinary Medical Association was asked to nominate a member to sit on the committee and has selected Mr. G. P. Male. The remaining members of the Committee are Mr. E. C. Lloyd and Mr. T. M. Doyle of the Ministry, and Mr. H. German of the National Farmers' Union. The Committee is now sitting—one meeting having been held.

* * * * * *

Kidderminster F.U. have given support to the "panel" insurance scheme for dairy cattle. They went farther, and followed Mr. J. A. McLauchlin's advocacy of the insistence on the notification of contagious abortion and Johne's disease by passing a resolution to that effect. Norfolk F.U. is also supporting the voluntary scheme for the supervision of dairy herds.—*Farmer and Stock-breeder.*

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H.M. STATIONERY OFFICE PUBLICATIONS

The undermentioned have been published recently. Copies can be purchased through any bookseller, or directly from H.M. Stationery Office.

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Emergency Medical Services Memorandum 8. Hospital Treatment of Burns. April, 1942. (49-268-8.)	0 9	0 10

CLINICAL COMMUNICATION

Primary Adeno-Carcinoma of the Udder of a Milch Cow

J. E. KENNY, M.R.C.V.S.,

Veterinary Research Laboratory, Thorndale, Dublin

Introduction.—Primary adeno-carcinoma of the mammary gland of the cow is at present generally accepted as of rare occurrence. The relative immunity of the bovine udder from neoplastic disease is difficult to explain, especially when one considers the demands which are made on this organ by present-day intensive methods of milk production, its proneness to chronic mastitis, and the fact that the dairy cow, unlike the majority of bovines, is as a rule allowed to live well beyond what is described as the cancer age. Drabble (1929) suggested that a more thorough examination of udder lesions, particularly from the histological point of view, might lead to a reorientation of our views as to this relative freedom of the cow's udder from neoplasia. The writer subscribes to this view and is of the opinion that at least a small percentage of cases now described as chronic mastitis may be neoplastic in nature. Macroscopically, the udder lesion in the case to be described presented at least a superficial resemblance to induration resulting from chronic mastitis. It was the presence and macroscopic appearances of what proved to be metastases in the lymphatic glands, lung and liver that first suggested that the condition present in the udder was possibly neoplasia.

A study of the veterinary literature indicates the small number of authentic cases of carcinoma of the bovine udder which have been recorded. Sticker (1902), Cleland (1908), Murray (1908), Drabble and Massy (1926), Drabble (1929), and Hynes (1934) have reported cases. Feldman (1932) mentions that his collection includes one tumour of this type. In considering these recorded cases a clear distinction should be made between true udder carcinoma arising from the parenchyma of the gland and squamous cell carcinoma originating from the skin covering the udder. The cases described by Drabble and Massy, Drabble, Hynes and also Feldman's tumour may be placed in this latter category. As far as the writer is aware, no case having its origin from the epithelium of the alveoli of the bovine udder and meriting the name adeno-carcinoma has previously been described and for this reason the present publication may be of interest to students of comparative oncology.

Subject, History and Ante-mortem Examination.—The subject of this article was a ten-year-old, red and white, Shorthorn milch cow which the owner suspected to be suffering from tuberculosis because of a chronic cough and wasting. She had calved normally four months previously but did not come to her milk properly, developed a cough and was described by the owner as wasting away. Examination prior to slaughter by J. F. Nally, M.R.C.V.S., Ballymahon, showed the animal to be in poor condition, but not emaciated, very tucked up and empty looking, as a result of feeding badly or at least indifferently. The respirations and pulse were increased in frequency and the cow coughed when pushed about. The left side of the udder, particularly the hindquarter, was visibly enlarged and on palpation a large area of deep-seated induration was noted. The left supramammary gland was greatly enlarged and firmer than normal. No skin lesions were seen on any part of the body and the orbital regions did not show any abnormality.

Post-mortem Examination.—In addition to the lesions in the udder and left supramammary gland multiple lesions were found in the lungs and liver; the bronchial and mediastinal lymphatic glands were also affected and one small lesion the size of a hazel nut was observed on the peritoneal surface of the diaphragm. The lungs showed evidence of a slight broncho-pneumonia. The lesions in the udder and left supramammary gland were by far the most extensive. A description of the approximate size, shape, colour and consistence of the various lesions is given below. No tuberculous lesions were found.

Laboratory Examination.—Material forwarded for laboratory examination consisted of portions of udder, supramammary gland, lungs and liver. Two portions of udder were received, one containing the larger part of a firm, yellowish-white growth and another apparently normal part with the enlarged supramammary gland attached. The udder parenchyma did not show any evidence of mastitis and was normal in consistence. The udder lesion was roughly spherical in shape; the portion received measured 10 cm. at its widest part. The cut surface showed a number of brownish areas which were probably old haemorrhages. The growth was non-encapsulated and at its periphery appeared to be in intimate association with the udder parenchyma. The infiltrative nature of the lesion was noted, many islands of udder tissue surrounded by abnormal growth being observed. The portion of the left supramammary gland received indicated that the growth was approximately spherical in shape (9 cm. in diameter). Lymphatic tissue appeared to be completely replaced by firm yellowish to yellowish-white growth containing large areas of necrosis. The cut surface presented a necrotic and mottled appearance, the latter being due to an admixture of yellowish and dark brown areas (the latter were suggestive of old haemorrhages). The capsule of the gland was markedly thickened. Each of the two portions of lung received showed the presence of a growth of approximately the same size and appearance. The lesions were situated immediately beneath the pleura, were irregularly spherical in outline (diameter about 4 cm.), firm in consistence, yellowish-white in colour with a sulphur-coloured area (probably representing some degenerative change) towards the centre. One of the tumours showed on its outer aspect multiple nodular outgrowths (0·5 to 1 cm. in diameter) which were covered by the pleura. The lung parenchyma showed evidence of broncho-pneumonia. Multiple small, spherical to ovoid, moderately firm yellowish-white growths were present in the liver. These lesions were for the most part superficially situated, being mostly subcapsular in position. The largest growth present, measuring 2 cm. × 1 cm., bulged directly beneath the liver capsule. The remaining growths averaged about 1 cm. in diameter. There was no evidence of encapsulation. The liver parenchyma was of normal appearance and consistence.

Microscopical Appearances.—It is not proposed to give a comprehensive description of the histopathological appearances of the various growths but it is hoped that the accompanying photomicrographs will cover some of the omissions. Microscopical examination of paraffin sections from the udder lesion showed that, as intended, a small area of normal udder tissue had been included. This latter area presented the picture of normal large secreting and narrow inactive alveoli, lined by one or more layers of columnar or cuboidal epithelium. Passing from this portion of the section, a gradual transition from the normal orderly arrangement of the udder parenchyma into a less differentiated type of growth, of a definitely adenomatous nature, was noted. Alveolar formation was more irregular in distribution and outline, and while in some cases the epithelial lining closely resembled that of the normal inactive alveoli, many others showed great epithelial hyperplasia with heaping up of the cells to form many indistinct layers. The lumina of many alveoli were partially or completely filled with epithelial cells. The histo-pathological changes here seen were more suggestive of a progressive proliferation of the epithelium, such as one associates with carcinoma, rather than a destructive inflammatory change. The infiltrative nature of the growth was also noted, many fields showing that the epithelial cells of various alveoli had penetrated the basement membrane and invaded the surrounding stroma. In other parts alveolar formation was rudimentary, lumina were less prominent or absent and the epithelial cells were for the most part arranged in clusters or loose masses. There was much variation in the size of the nuclei, most of which were definitely larger than normal. A few mitotic figures were noted. Prominent fibrous trabeculae were present but in some parts the stroma was quite cellular. Sections from the central portion of the udder lesion showed the presence of numerous small haemorrhagic centres, a number of faintly staining neoplastic elements scattered about in irregular fashion, and several areas of total necrosis. Sections from the supramammary gland showed for the most part a similar picture to those from the central portion of the udder lesion. Necrotic areas were very prominent. It was only in the sections made from the periphery of the gland that definite tumour formation and lymphatic tissue were found. The cytoplasmic and nuclear characters of the growth were similar to those of the udder lesion but the neoplastic elements for the most part lacked orderly arrangement. A few epithelial clusters were present but acinus formation was rudimentary. The growth in the lung presented a very interesting histological picture, consisting of epithelial proliferation of an adenomatous type, showing in its less anaplastic portions a marked resemblance to the more differentiated parts of the primary growth. Not only did the tumour cells resemble those lining the udder alveoli but acinus formation was in places very distinct. Such features as complete and rudimentary alveolus formation, heaping up of the epithelial lining, lumina of alveoli partially filled with epithelial cells, and massing of epithelial cells to form clusters, were noted. Numerous minute haemorrhages and a few small necrotic areas were seen. There was a very rich and in many parts quite cellular connective tissue stroma. The non-neoplastic portion of the lung showed the histo-pathological picture of purulent broncho-pneumonia. The liver neoplasms showed a structure and cytology resembling closely that of the lung and udder tumours. The growths were non-encapsulated and of a distinctly infiltrative type and there was no definite line of demarcation between the

(*Concluded at foot of col.* 1, *page* 241.)

J. E. KENNY: PRIMARY ADENO-CARCINOMA OF THE UDDER OF A MILCH COW

(Photomicrographs from sections of primary tumour and metastases in lymph gland and lung)

FIG. I

Neoplastic tissue on left separated from normal udder tissue on right by a wide septum of connective tissue with, top centre, a concentrated mass of tumour cells within torn vessel. X 45. Stained Haematoxylin and Eosin (Kampff).

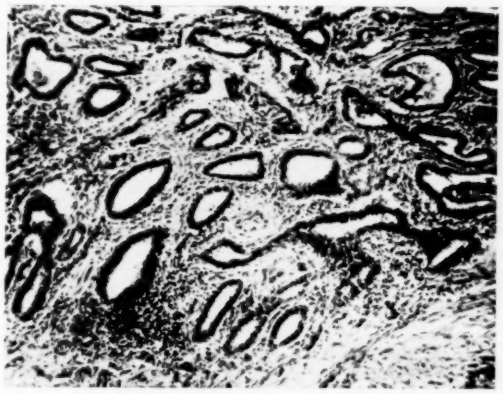

FIG. III

Section from primary lesion. Field showing alveolar formation and mainly cellular stroma. Infiltration of the latter by epithelial cells of some of alveoli, particularly the large alveolus near the left hand bottom corner. X 120. H. & E. (Briggs).

FIG. II.

Another field from udder showing a compact mass of tumour cells. X 45. H. & E. (Kampff).

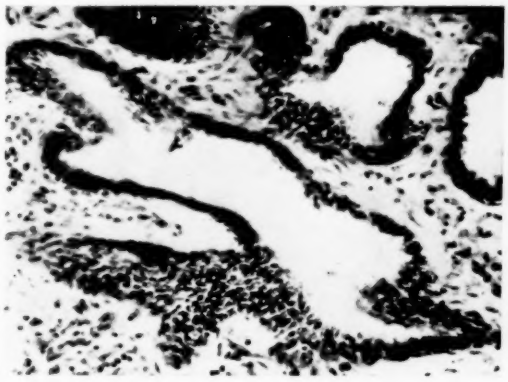

FIG. IV

Section from primary tumour. Showing irregular alveolar formation, heaping up of lining cells and large finger of epithelial elements extending into stroma. X 300. H. & E. (Briggs).

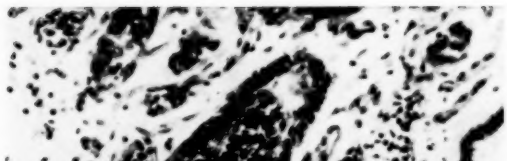

FIG. V

Section from primary tumour. Showing alveolus almost completely filled with epithelial cells. In the lower portion there appears to be an attempt to prevent the extension of these epithelial elements into the stroma. Note imperfect alveolar formation in top left hand corner. X 300. H. & E. (Briggs).

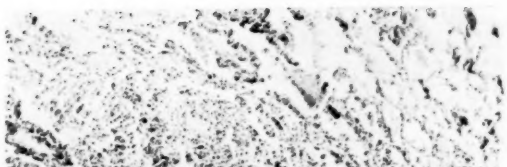

FIG. VII

Section from lung showing lung tissue and neoplasia (particularly well marked towards left hand bottom corner). X 50. H. & E. (Kampff).

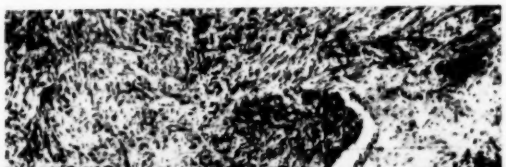

FIG. VI

Section from supramammary lymphatic gland showing above tumour formation partially separated from lymphatic tissue in lower half of field by a septum of fibrous tissue. X 50. H. & E. (Kampff).

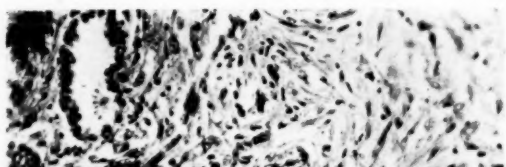

FIG. VIII

Section from lung tumour showing a marked resemblance to parts of the primary growth. X 200. H. & E. (Kampff).

ABSTRACT

[THE NUTRITIONAL PHYSIOLOGY OF THE ADULT RUMINANT. RITZMAN, E. G., and BENEDICT, F. G. (1938.) Carnegie Institution of Washington, Publication No. 494.]

(*Continued from page* 227.)

METABOLISM

Metabolism is the process by which the body transforms the energy of inert matter into active motion with the production of heat in the process. The heat production of total metabolism is due to two different causes, one internal and one external. The amount of heat derived from within the animal is determined by the inherited constitutional factors such as age, size, rate of growth, sex, breed, etc.; this constitutes the metabolism due to basic function. The external causes of heat production are muscular effort, the stimulating effect of food and environmental conditions. The metabolism due to internal causes remains relatively constant throughout the day, while the heat due to external causes fluctuates considerably; consequently it is essential to eliminate all external influences when measurements of basal metabolism are made.

Basal Metabolism.—The animal must be starved until heat produced as a result of the ingestion of food has disappeared in order to bring the production of heat to basal level. Rubner stated that the minimum amount of heat which an animal must produce in order to live is determined by the rate of heat lost to the environment and that all warm-blooded animals give off heat in direct proportion to their surface area and at the constant rate of 1,000 calories per square metre in 24 hours. According to this hypothesis the cause of metabolism is purely external and heat is produced to maintain the body at a constant temperature. It is well known that as the environmental temperature drops and heat lost by radiation increases, a point is reached at which heat lost is equal to normal heat production. At this point the amount of heat produced is at a minimum, as any further drop in the environmental temperature stimulates an increase in heat production. Rubner's law holds good only for changes of temperature outside the rate of thermic neutrality, but within this range it is now known that an animal does not metabolise because it must produce heat, but produces heat because it metabolises. If this were not so then the animal should cease to produce heat when the environmental temperature is sufficiently high to maintain the bodily temperature.

Basal metabolism must allow for differences in physical vigour and stamina which vary in the same individual from time to time; it must also allow for differences in physical adaptation, internal and external. A high basal metabolism in a beef steer would defeat the function of the animal which is to store energy; in dairy cows the reverse is needed, as energy is required to stimulate mammary activity. The basal metabolism must be fitted to the function of the animal which is determined by heredity.

Physiological types, lean and fat, phlegmatic and nervous, are determined by the endocrine balance and although such glandular activity may be within the normal range for any type, the rate of metabolism may differ according to this balance; it is well known that pronounced thyroid activity results in a higher basal metabolism. Rubner's law is no longer tenable and experimental evidence proves that the variation in warm-blooded creatures is too great to be explained by this hypothesis. Benedict and Lee (1936) found that the basal metabolism per unit body surface area of the fat mouse weighing 59 grammes was double that of the dwarf mouse and 15 per cent. greater than that of the albino mouse. In spite of results such as these, belief in the constancy of the basal metabolism is still widely held.

Examination of the literature reveals that studies of metabolism on men and dogs carried on over a period of months give conflicting results regarding the constancy of the basal metabolism, but, generally speaking, seasonal fluctuation occurs. Information for cattle is fragmentary, largely because it was thought until recently that these animals did not withstand prolonged starvation.

Technique of Basal Metabolism Measurements in Cattle.—The animals must be at rest in order to measure basal heat production; as it is impossible to ensure that this is so, some factor must be introduced to correct the results for the energy expended in muscular movement. After many measurements the authors have calculated that 2·5 calories are expended by a cow per 100 kg. live weight in the double act of getting up and lying down and that while standing the metabolism is increased by 10 per cent. These factors, together with observations regarding the number of times these movements are performed during the experimental period, have been used to correct all measurements for basal heat production.

Post-Absorptive Condition.—The period during which absorption of any meal occurs is longer in the ruminant than in the dog and man owing to the slow rate at which ingesta pass through the alimentary tract. The products of digestion appear to be highly stimulating to the metabolism and the effect of eating disappears slowly. These conditions, together with the large amount of gas that is produced in the rumen, make the measurement of the heat produced by the ruminant a more complicated business than in man or the dog.

Fasting is distinct from starvation; the former term is used to indicate the post-absorptive condition in which the animal is living on its stores of glycogen and fat, while the latter term is used to indicate the acute condition that follows fasting, in which the greater part of the active body tissue is being consumed.

The disappearance and cessation of absorption is accompanied by a decline of the total metabolism to a more or less constant level; the respiratory quotient falls to 0·7, characteristic of the combustion of fat, methane production ceases, and the urine becomes acid. Four days without food are necessary before the post-absorptive condition is reached when cattle have been fed hay, but when the diet has been fresh grass or concentrates two or three days are sufficient. The respiratory quotient may be slightly higher than 0·7, as glycogen is also being used. The metabolism remains at a relatively stable level for 48 hours or more once the post-absorptive condition is reached.

The zone of thermic neutrality must be maintained during measurements of basal metabolism; if the temperature is too high difficulty is experienced by the animal in getting rid of excess heat, while if it is too low the animal must produce heat more rapidly to counteract heat lost by radiation. The zone extends to a lower temperature in ruminants than with small animals; the fleece of sheep and the thick coat of cattle afford adequate protection against cold and with regularly fed animals there is no significant alteration in heat production between the temperatures of 18·5 and 8·4° C. During fasting the zone of thermic neutrality is less wide and in cows heat production is constant only between 20 and 15° C.

The following procedure is adopted by the authors for measurements of basal metabolism:—

1. The cow is kept for 30 days on a maintenance ration of constant character and quality.

2. The cow is maintained for 30 days in a laboratory at a constant temperature between 18 and 22° C., within which range the basal metabolism is measured.

3. Metabolism is measured on the fourth and fifth day of fast if it has been previously fed on hay, but on the second and third day of fast if it has been previously fed on concentrates or if it has been at pasture, while if the cow has been kept on a super-maintenance ration measurements are taken on the fourth day of fast.

4. At least two but preferably four consecutive twelve-hour periods are measured with the cow standing or lying quietly at will.

5. The result is corrected on a 24-hour basis for lying, assuming that 2·5 calories are expended in the double act of getting up and lying down and that the effort of standing increases the metabolism by 10 per cent.

6. Observations of the heart rate and rectal temperatures are made daily to ensure that the animals are normal.

7. Measurements are made about half way between each period of oestrus to avoid the effect of this factor.

Evidence of the Liability of Basal Metabolism.—The basal metabolism of seven Holstein and four Jersey cows was measured on different rations. The weights of the animals varied considerably on account of irregularities in eating and drinking and an

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tumour and the liver tissue. Many fields showed neoplastic cells infiltrating into the liver tissue and mingling intimately with those of the liver parenchyma. Numerous minute haemorrhages were present. There was no evidence of cirrhosis.

Diagnosis.—Primary adeno-carcinoma of the udder, with metastatic growths in the local lymphatic gland, liver, lungs and possibly in the bronchial and mediastinal lymphatic glands and diaphragm.

Acknowledgments.—I wish to acknowledge the help received from my laboratory colleagues and my indebtedness to Messrs. Briggs and Mullaney, Veterinary College, Dublin, and W. Kampff, School of Pathology, Trinity College, Dublin, for photomicrographic work.

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average weight over a period of ten days was taken in order that all results could be recorded as calories per 500 kg. live weight. The weight of the ingesta was assumed to be 12 per cent. of the live weight when the animals were feeding regularly during the pre-experimental period; when the ration was in excess of maintenance it was assumed to be 20 per cent. of the live weight, but when grain alone was fed a low figure, 7 per cent. of the live weight was taken.

Wide variation was found to exist in the basal metabolism and the following results were obtained:—

Cow	No. of Experiments	Minimum calories	Maximum calories	Per cent. range
H I	3	5,920	7,685	30
H IV	11	5,120	8,565	67
H V	16	4,770	8,120	70
H VI	3	7,565	9,840	30
J I	6	7,705	10,490	36
J II	8	6,310	11,400	80
J IV	3	5,470	9,515	74

These measurements were performed on dry, non-pregnant cows and no significant change in body weight occurred throughout the experiments. The diet was different before each experiment, but the cows were fed only at maintenance level. All measurements were made in the post-absorptive condition and the fluctuations are too great to be accounted for by experimental error. In individual animals similar fluctuations occurred within a comparatively short time on the same diet: the variation found in Holstein animals on alfalfa hay was 50 per cent., in Jerseys on oat straw it amounted to 71 per cent. Similar results were obtained in steers when measurements were made 24 hours after feeding, when greater fluctuation occurred on a fattening ration than on a maintenance diet.

All results are expressed in terms of calories per 500 kg. live weight, consequently variation in weight of the animals cannot account for the fluctuations. Young growing animals have a higher metabolic rate than adults, yet all animals used in these experiments were mature and sexually vigorous, their ages varied from 3 to 15 years, and in some cases they were studied over a period of four to five years. The rations fed were slightly in excess of maintenance and were designed to contain 12,000 to 20,000 calories and sufficient protein, any digression being on the plus side. The average daily loss of energy through the faeces, urine and gases was deducted from the total daily energy intake in order to ensure that the excess energy contained in the ration was not responsible for the variation, and it was concluded that the variation in nutritive level within the limits of maintenance feeding is not responsible for the lability of the basal metabolism.

In two lactating cows it was found that lactation ceased by the fourth or fifth day of fast, but, even so, the basal metabolism was higher in these two animals than at any other time except when they were measured after coming in from pasture. In one cow that was measured during pregnancy the basal metabolism rose from 8,370 calories at the fourth month of pregnancy to 9,140 calories at the sixth month. Later, when lactating, the basal metabolism was higher still, the figure of 11,795 calories being found.

The season exerts a marked difference on the basal metabolism: it was lowest in April, during May and June there was a marked rise but it again declined during the summer. In all instances the same general trend was found and all animals showed the same tendency to be low in winter and spring and high in the early summer. The increase coincided with the longest hours of daylight and is due probably to increased thyroid activity.

Heredity and Hormones.—Animals which have been bred to lay on flesh, such as the beef steer, have smaller vital organs in comparison to their size than animals that are bred for production, such as the dairy cow. Similar differences exist between the heavy draft horse and horses bred for speed. The temperament also differs in these types, the dairy cow and the race horse being temperamental, while the beef steer and cart horse are placid and phlegmatic. The endocrine glands are believed to determine the hereditary types, consequently such factors as surface area and size are not those directly controlling basal requirements, but the individual basal requirements are the result of glandular activity which is determined by inherited characters.

Average Basal Metabolism of the Cow.—Any attempt to give average figures for the basal metabolism must be qualified by statements regarding the condition of the animal; whether she is pregnant, lactating or dry, etc. In respect of diet two types are considered, hay feeding and grass feeding. On maintenance hay rations the average basal metabolism of the Jersey cows which were non-pregnant and dry was 8,170 calories per 500 kg. live weight and for Holsteins 6,665 calories. During the summer when the animals were living an active outdoor life at grass the average basal metabolism was about 24·5 times higher. Data regarding sex is meagre; the authors found that the basal metabolism of an adult "billy goat" was nearly 30 times higher than that of a "nanny." Similarly the metabolism of five fasting bulls was greater than that of lactating cows.

Stimulating Effect of Food.—It is known that the ingestion of food has a marked effect upon the heat production; in man, the dog and the rat protein produces the greatest effect, but in the ruminant less data is available. One point that remains unexplained is that the respiratory quotient in most cases was greater than one during normal feeding. The high respiratory quotient, according to the authors, is more unexpected as absorption in the ruminant is delayed for 12 to 24 hours after feeding. [There is an increasing amount of evidence to show that absorption commences soon after feeding in the ruminant.—A. T. P.]

The initial stimulation of heat production has been ascribed to the greater activity of the animal which may be called the work of digestion and includes increase in secretion of the digestive juices and increased movements of the gastro-intestinal tract. Grouven (1864) suggested that fermentation in the rumen with the resulting production of fatty acids was the cause of the large increase in heat production in the ruminant; this theory was acceptable until the authors demonstrated that the same stimulation occurred in the horse and the elephant in which fermentation is delayed until the ingesta reach the caecum. The heat increment in horses is variable, but is particularly marked when grain is fed.

The effect of feeding hay and concentrates was measured in numerous experiments in cows and steers. In some animals the respiratory quotient was measured at hourly intervals after feeding for twelve hours. After feeding hay and linseed meal the highest respiratory quotient was reached less than one hour after feeding; it persisted for twelve hours and then declined. After feeding alfalfa hay the increase occurred after an initial lag of two hours, while this lag was increased to four hours after feeding timothy hay. The respiratory quotient increased to a maximum between two to seven hours after feeding maize meal and hay in steers. The total heat production was found to vary considerably and the heat production was increased from 30 to 100 per cent. after feeding the same ration. Some animals returned to a lower base line after feeding than before. The authors consider that the most plausible explanation for these phenomena is that variation in the relative activity of the various endocrine glands occurs.

Evaluation of Foodstuffs

The following factors must be recognised in evaluating foodstuffs:—

1. The possible causal relationship of the stimulus of food to the specific functions of the animal.

2. The effect of genetic variation of basal metabolism on the methods of utilising energy.

3. The effect of seasonal variations in basal metabolism on the utilisation of energy.

The authors have concentrated upon demonstrating the error caused by disregard of any or all of these factors in evaluating feeds. The potential merit of any food is best measured by using a group of animals and the highest net value represents the potential value of the food. The basal metabolism, owing to its variation, must be measured during any feeding trial, also it is desirable to measure every factor which may influence the result rather than to take approximate values of other workers.

Protein.—It is difficult to determine the minimum nitrogen requirements of cattle, as it is impossible to separate the endogenous nitrogen fraction from that of the food nitrogen in the urine unless a nitrogen-free diet is fed. The excretion of nitrogen during fast gives the nearest approach to the basal needs, but as the animal has to rely upon its stores of fat for its energy requirements and as some protein is also used for this purpose, the nitrogen excreted is greater than if a nitrogen-free diet was fed to supply the calorific requirements of the animal. The amount of nitrogen excreted by the fasting Holstein cows was found to be on an average 40 grammes per 500 kg. live weight, with Jersey cows the average figure of 47 grammes was found and in steers a figure of 38 grammes per 500 kg. live weight. This corresponds to about 225 to 300 grammes digestible protein as a daily requirement for the replacement of bodily wear and tear. The protein needed for fattening is only slightly in excess of basal requirements except in the early stages; in steers protein storage decreases to 20 to 28 grammes per day after six weeks on a fattening diet.

The most practical way of obtaining approximate values for the minimum protein requirements, excluding the method of feeding a protein-free diet, is to measure the urinary nitrogen while the animal is on a low protein diet. Mitchell (1929) calculated by this method that the minimum requirements of cattle are 0·03

gramme of nitrogen per kg. live weight; this value falls within the limits of those found for man, the pig and the dog. The amount of protein in the food has no bearing on the amount of nitrogen the animal can store over its maintenance requirements. The quantity stored is determined more by the state of the individual and may even be hindered or restricted by an increase in the protein intake. The nitrogen excreted in the urine less the endogenous nitrogen is taken as a measure of the waste nitrogen; this may be high in fattening cattle and lactating cows and there is no foundation for the theory that feeding excess protein in dairy cattle produces a greater milk secretion by stimulating the mammary gland. Protein requirements for milk production are lower than the accepted standards indicate.

Dynamic Stimulus.—The energy of food that is converted into heat is generally considered to be a loss of calories to the animal. Protein causes the most marked rise in heat production in the dog and man, but in herbivores the effect is most marked with carbohydrates. The energy lost in the faeces and urine is taken into account when calculating the digestibility of foods, but in man the heat increment after feeding protein is not deducted as a loss. This is because the energy contained in protein rarely exceeds 15 per cent. of the total energy and so it is not particularly significant in calculating the total energy available in the food. In ruminants carbohydrates constitute the largest part of the food and so the heat increment is considerable. The ingestion of meat, fat and carbohydrate in the dog increases the heat production over the basal heat level by about 36·7, 12·7 and 5·8 per cent. respectively. The authors found that feeding timothy hay to cows in which protein amounted to only 6 per cent. of the total metabolisable energy resulted in an increase of heat production that exceeded the basal heat production by 50 to 100 per cent. This loss of energy must be made good by the energy of the food, consequently, in evaluating any foodstuff, it is necessary to consider the relative proportions of protein and carbohydrate in the diet and the relation of the dynamic stimulus of these two factors.

Zuntz put forward the theory that the greater expenditure of energy in cattle was used to move the mass of food through the alimentary tract, but as the same stimulus occurs when rations composed of maize meal or linseed meal and bran are fed, the theory is not valid, as either of these feeds can be eaten and passed with less expenditure of energy than feeds of roughage. The low protein content of roughage indicates that this cannot be the stimulating factor and it seems probable that the rapid fermentation of carbohydrates in the rumen, with the production of lower fatty acids, together with gas, is the cause of the large heat increment. As has been pointed out previously, the authors consider that this cannot be the sole cause, as the same increase in heat production occurs in the horse.

Relationship between heat increment for maintenance and digestible constituents of the feed.—The same principles that are applied to man have been used with cattle; these are to regard the basal metabolism as represented by the fasting value when at rest and the true stimulating effect of food as the difference between the basal metabolism and the heat production during two successive twelve-hour periods each following ingestion of food, all values being corrected to the lying position. This value, uncorrected for the energy expended during eating and standing, is regarded as an approximate measure of the energies used for maintenance above basal requirements. The true stimulus is the heat resulting from stimulation of the tissues not augmented by the visible movements of the body. The relation of the heat increment for maintenance and the digestible constituents of the food has been worked out and shows fairly close agreement, but the heat increments or calories of dynamic stimulation per gramme of these constituents from different feeds show considerable difference: the results for crude protein vary from 1·4 to 56·9 calories and for waste urinary nitrogen or for protein that is oxidised for its heat alone, 27 to 1,457 calories; digestible crude fibre, however, gives more uniform results, namely, 3·7 to 7·1 calories.

Effect of assuming that basal metabolism is constant upon the evaluation of the net energy of the feed.—The fluctuation in the basal metabolism indicates that the number of calories expended in maintaining body heat is a variable proportion of the food consumed; in the season of high basal metabolism a smaller number of calories are available for production. An error of 22 per cent. was found to occur in measuring the net energy when calculations were made by assuming a cow had a constant basal metabolism, when it was found by experiment that it varied from — 10 to + 12 per cent. of the assumed value.

Digestible Energy.—The usual method of expressing the nutritive value of a food for livestock is by the total digestible nutrients, which represent the weight of the digestible crude protein, carbohydrates and fat added together. This measure, whether expressed in grammes or calories, represents only what is contained in the food and not the effect it can produce in the animal; it takes no account of the energy lost in the urine and this value, although constant between individuals, varies with the diet and especially with the amount of protein fed. The loss of energy due to methane is more constant, but the variation is of material proportions.

The energy consumed can best be expressed as digestible energy, metabolisable energy or as net energy per kg. digestible material. The latter value represents the metabolisable energy minus the heat increment. The digestible energy shows little variation—the maximum fluctuation was found to be 3·2 per cent.—similarly, values for metabolisable energy vary only within this limit, but net energy values vary from 6·3 to 36·4 per cent. in individual animals. Erratic values found by others for the net energy appear to be due to the difference between various types of animals, to the stimulating effect of food and to the lability of the basal metabolism. The latter factor makes it imperative to measure basal metabolism before determining the net energy.

Metabolisable Energy.—The complete picture of the utilisation of the energy of food is in the total energy that is metabolisable. The ultimate fate of the metabolisable energy can be determined with accuracy; it is converted to body tissue, or to milk, or else is directly oxidised. It is open to question whether the heat expended in the initial stimulation is wasted; if the tissues and glands require stimulation in order to function properly then the heat used in this process as distinct from the heat required for the deposit of tissue, together make the metabolisable energy a reliable guide to the value of the food.

Experiments on steers showed that a higher metabolic plane was produced during the fattening period than during store condition; Kellner also reported that fattening oxen had a 26 per cent. higher maintenance requirement than a lean animal. The higher basal metabolism of lactating cows over that of dry cows suggests that the stimulating effect of food is as essential as the energy needed for milk production. The evidence regarding the energy requirements for the latter process is, however, not satisfactory, and it cannot be assumed that a specific rôle is played by the heat of stimulation.

Metabolisable Energy for maintenance.—The values calculated for this measure by the authors were taken from data obtained on dry non-pregnant cows. It is assumed that the stimulating effect of increasing quantities of the same feed from zero energy balance upwards is proportional to the total metabolisable energy and that the deposit value of metabolisable energy in amounts above that of maintenance is the same for maintenance. The rations were kept approximately at maintenance level and the deposit values, if any, cause only an insignificant error.

The average metabolisable energy at zero energy balance for all experiments with dry Holstein and Jersey cows was 12,740 calories per 500 kg. empty live weight; as the individual variation was large the authors hesitate to put forward any average figure as representative and emphasise again that a large part is played by individuality and breed in determining the energy needed for maintenance.

The efficiency of metabolisable energy at maintenance and for production.—The amount of metabolisable energy used at maintenance in the heat increment and the amount used for support of basal requirements was calculated by expressing the basal metabolism as a percentage of the metabolisable energy, that is by estimating the percentage of the total energy used that was consumed by basal requirements. This figure subtracted from 100 must equal the percentage of the metabolisable energy of the maintenance ration expended in the heat increment. This figure remained remarkably constant regardless of the heat requirements for basal conditions, which indicates that a low basal metabolism is not associated with a large expenditure of energy as heat increment. The regularity of the physiological uses of metabolisable energy at maintenance and the constancy of the metabolisable energy per kg. digestible dry matter of the food indicates that the metabolisable energy should be a reliable measure of the value of feeds at maintenance.

This work was done to lay a foundation regarding the metabolism of the cow as it is affected by genetic adaptation, season, mode of living and different feeds. The study deals only with food requirements and the utilisation of food at maintenance. The variation in basal metabolism and consequently in requirements becomes logical if the principle that vital processes are dominated by the function of the various organs and glands of the animal is accepted; an unavoidable conclusion is that in any process of convertion of energy the tissues must be stimulated to activity. The authors conclude that true physiological duplicates are the exception rather than the rule and that the study of nutritional physiology becomes the study of the individual rather than of the average; for this reason experiments to determine the value of foodstuffs for production must be carried out with specially selected individuals whose physiological adaptations for the purpose of convert-

ing the energy of food into body tissue or milk are highly developed.

A. T. P.

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(The references marked with an asterisk have been quoted by the abstractor and are not included in the monograph. A criticism of this monograph has been published by Forbes, E. B. (1939.) *Science* **40** n.s. 270, to which reference should be made.)

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

June 18th.—Annual General Meeting of the Society of Veterinary Practitioners at Africa House, Kingsway, W.C.2, 2.15 p.m.
June 19th.—Meeting of the North Wales Division, N.V.M.A., at Llandudno, 2 p.m.
June 25th.—R.C.V.S. Written Examinations begin.
June 29th.—R.C.V.S. Oral and Practical Examinations begin.

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Association Correspondence

All correspondence for the General Secretary, N.V.M.A., also for the Editorial Representative, should now be addressed to No. 36, Gordon Square, London, W.C.1.

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ROYAL COLLEGE OF VETERINARY SURGEONS

Dr. A. W. Whitehouse Elected President

At the meeting of Council held in York on June 3rd, the Presidency of the Royal College of Veterinary Surgeons was conferred upon Dr. A. W. Whitehouse, M.A. (Oxon.), M.R.C.V.S., V.S. (Ontario), D.V.S. (Colorado), Principal of Glasgow Veterinary College.

The profession will welcome Dr. Whitehouse as one eminently worthy to relieve Mr. John Holroyd, of Blackburn, who has borne the honourable burden of his high office through a long and arduous war period. We shall take further and early occasion to pay tribute to the new President, to whom the honour comes in natural succession, not only as a Vice-President of several years' standing, but as one who has deserved well of his profession through his service to the Council and to the teaching institution of whose interests he has been the indomitable champion since he succeeded the late Professor Gaiger as Principal in 1922.

Health and Unemployment Insurance

The N.V.M.A. desires to remind those concerned that contributions in respect of both Health and Unemployment Insurance are payable where the remuneration of an employee is up to and including £420 per annum.

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PERSONAL

Birth.—Spreull.—At Maroc, Dunure Road, Doonfoot, Ayr, on May 29th, to Mr. and Mrs. Andrew Spreull, a daughter.

Many young members of the profession are acquainted with R. J. H. Dixon, Royal Armoured Corps, son of Colonel J. A. Dixon, of Leeds. They will be interested to learn that, having voluntarily transferred to the Indian Army in May, 1941, since when he has served as an officer of the Royal Deccan Horse Regiment, he has now been seconded for service with the Patiala Lancers as Captain.

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R.C.V.S. OBITUARY

Austin, William Arthur, M.R.C.V.S., Capt. late R.A.V.C., of 5, Estcourt Street, Devizes, Wilts. Graduated London, July 10th, 1913. Died May 29th, 1942; aged 50 years.

Wickett, George Augustus, Bideford, Devon. Graduated London, December 17th, 1891. Died May 22nd, 1942; aged 70 years.

Williams, George Harry, M.V.O., M.R.C.V.S., M.R.C.S., late of 15, Holbein Place, Sloane Square, S.W.1, at 84, Sandcross Road, Hartwell Estate, Reigate. Graduated London, May 17th, 1889. Died June 1st, 1942; aged 79 years.

Mr. G. H. Williams was Veterinary Surgeon to His Majesty the King at the Royal Mews.

Mr. William A. Austin, M.R.C.V.S.

Mr. W. A. Austin, whose death we record above with much regret, had a wide circle of friends both in the profession and amongst the residents of Devizes and neighbouring areas of Wiltshire, while his work as a part-time inspector for the Ministry brought him into contact with large numbers of agriculturists, who also held him in high esteem.

Mr. Austin went to Devizes from Windsor in 1912, as assistant to the late Mr. Frank Bazley, M.R.C.V.S., in the latter's veterinary practice, at 5, Estcourt Street. Throughout the last war he served abroad in the Royal Veterinary Corps, attaining the rank of Captain, and on its conclusion returned to Devizes, taking up the post once more as assistant to Mr. Bazley. In October, 1920, on Mr. Bazley's death, Mr. Austin took over the practice, in which he continued until illness laid him aside. Deep sympathy is extended to the widow, a daughter of the late Mr. William Robbins, a former Mayor and Alderman of Devizes, whom Mr. Austin married in 1920.

The funeral service was held at Southbroom Church, the interment following at the Cemetery. The Vicar (the Rev. A. W. Douglas) officiated, and among the large company present were Mr. Esmond Brown and Captain J. A. McCutcheon, representing the Ministry of Agriculture, and Mr. S. V. Golledge, representing the Mid-West Veterinary Medical Association, of which Mr. Austin was a most faithful member.

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ROYAL ARMY VETERINARY CORPS

The following announcements are made in *The London Gazette*, dated May 29th, 1942:—

Lt.-Col. F. B. Hayes, O.B.E. (22841), retires on Ind. Pension, June 2nd, 1942.

Maj. J. J. Plunkett, O.B.E. (9986), to be Lt.-Col., June 2nd, 1942.

* * * * *

Speaking at a conference of the Association of Scientific Workers, Mr. H. W. Steele-Bodger, Chairman of the N.V.M.A. Animal Diseases Survey Committee, said that animal husbandry was the branch of agricultural science in which there was the biggest leeway between knowledge and practice. The application of established knowledge should be made universal and compulsory, especially at this time when food production was so vital.

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Foot-and-mouth disease was confirmed on Sunday last among cattle and pigs at St. Agnes, Cornwall.

There is no doubt whatever that every step possible is now being taken by the Joint Tuberculosis Committee of the Agricultural Research Council and the Medical Research Council to meet the immediate need and to restore the degree of confidence that formerly existed in the industry in the tuberculin test under the Attested Herds Scheme, which had proved itself of great value to the industry and to the public. Tuberculin testing on present lines should be continued until it is replaced by something better.—*Dr. Chalmers Watson.*

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Monday morning for insertion in following Saturday's issue.
The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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BOVINE INFERTILITY

Sir,—Messrs. Steele-Bodger and Gould having demonstrated their undoubted mathematical abilities in estimating the thousands of tons of milk, fat and solids which they will save by operating the Survey Scheme, are now apparently busying themselves with an analysis of my medical history chart. Since the results of their calculations in the latter case have not attained a very high standard, one may be forgiven for wondering whether their other calculations may be subject to error. However, this is not the time for personal recrimination, the occasion is far too serious, and I value the friendship of these two gentlemen far too highly wilfully to hurt their feelings. Yet I think I might risk ruffling them just very slightly if thereby I were permitted politely to point out the precipice before the profession is propelled bodily over it. After doing this, I will refrain from burdening your columns further in this particular matter.

Mr. Steele-Bodger, apparently overwhelmed by a sudden access of modesty, writes, "All that we have promised or undertake to do is our best." Knowing Mr. Steele-Bodger's ability and zeal, I believe that, in the past, he has *always* done his best. In what respect will his "best" under the scheme exceed his previous "best"? How many remedies does the scheme offer which have not already been practised regularly by every up-to-date veterinary surgeon? Is Mr. Steele-Bodger satisfied that at his "*very* best" he can really control the diseases which he will have to tackle under the scheme? Will the results be those which the stock-owner has been led to expect and will the stock-owner be desirous of renewing his undertaking when the time comes for him to do so?

My clients express astonishment when I tell them that the treatment for mastitis will be identical with that which has been supplied them for some time past; they are amazed when I tell them that the proposed treatment for sterility has not changed one iota and they are disheartened when I warn them not to become too enthusiastic over the new abortion vaccines until they have been thoroughly tried out in practice. Johne's disease we do not discuss if it can be avoided.

By some means, farmers seem to have been prepared for greater things. They have expected Utopia to materialise. They have come to regard Mr. Steele-Bodger as a beneficent Father Christmas with a host of good things in his bag and they may be sadly disappointed if they find that the good things, so generously promised, are only last year's playthings with an extra lick of varnish.

I, too, have always done, and shall continue to do—my best. I shall apply, in the future, all the old and new remedies in which I place my trust. My clients will employ me—and pay me—in accordance with the benefit which they derive from my services. But I shall not co-operate in the Survey Scheme, *as it stands at present*, because in spite of my acknowledged shortcomings I still retain some sense of honour. Whatever its loopholes, I will not sign an undertaking which I cannot fulfil, for I am aware that, even at my best, I cannot efficiently control mastitis, Johne's disease or abortion, and my success in the treatment of infertility is still somewhat limited. Up to the present my clients have respected and trusted me. I wish to retain that confidence and I am adopting the course which I judge will best enable me so to do.

Yours faithfully,

Vean House, R. H. Smythe.
Camborne.
June 1st, 1942.

[It appears to the editorial eye that those acknowledged masters of infertility control who criticise the Survey Scheme, perhaps not unnaturally fail to realise that a very great percentage of farm practitioners were unaware of their potentialities until the refresher course came their way and opened their eyes. Thus the designation "up-to-date veterinary surgeon" as used by Mr. Smythe in the above letter is misleading in the sense that only in the past month or two have the majority of country veterinarians—on their own frequent and grateful acknowledgments to their tutors—become worthy of the title "up-to-date," in so far as this applies to infertility work. Future correspondents please note!—*Editor.*]

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PREPARATION OF SOLUTIONS OF CALCIUM BORO-GLUCONATE

Sir,—After it had been shown by Hayden in 1934 that boric acid was a solvent for calcium gluconate, Dryerre and I recommended the use of "calcium boro-gluconate" in the treatment of milk fever. I, then, considered that the most suitable formula was as follows:—

Calcium gluconate—2 oz. (*Apothecary*)
Boric acid—3 dr.
Water—12 to 14 oz.

This gives approximately the proportion of boric acid to calcium gluconate as 1:5.

It was even then (1934) recognised that the formula probably contained an unnecessarily large quantity of boric acid, but at that time much trouble in the form of serious local abscess formation was being experienced by practitioners in consequence of my previous recommendation (1930) that the subcutaneous injection of calcium gluconate alone could be employed as a specific in the treatment of milk fever. The addition of so large an amount of boric acid was, therefore, made with the object of rendering the calcium treatment as safe as might be.

At present there is a scarcity of boric acid in this country and the main object of this letter is to point out that the amount of this substance in the preparation of calcium boro-gluconate solutions can be very considerably reduced. I have found that boric acid and calcium gluconate in the proportion of rather less than 1:12 remain stable in aqueous solution for at least two weeks and that solutions of 1:8 appear to be perfectly reliable in that they remain stable for prolonged periods. It would seem, therefore, that manufacturing chemists and also those practitioners who prepare their own solutions of calcium boro-gluconate can quite safely use only one drachm of boric acid to each ounce of the calcium gluconate intended for administration.

I am, Sir,
Yours faithfully,

Moredun Institute, J. Russell Greig.
Animal Diseases Research Association,
Gilmerton, Midlothian.

P.S.—For those desiring further information on this matter the following references might be quoted:—

Macpherson & Stewart (1938). *Biochem. J.* **32**. 76.
Stewart & Macpherson (1938). *Vet. J.* **94**. 220.

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THE FUTURE OF MILK PRODUCTION

Sir,—I notice that you have a short article concerning the paper which Professor Kay read lately on "The Future of Milk Production." In case you may think that the remarks which I made are worth recording in your journal, I send them to you: they are as follows:—

"Colonel G. Rees-Mogg said that two years and nine months ago an enormous number of young healthy cows, heavy in calf, were sent to the butcher, and assuming that half of these had heifer calves, these would be just coming down calving now.

One speaker had remarked that heifers ought to be served so that they would come down to calve at two years old. To do this, it would be necessary to do animals very well from the day they were born, but it was not easy to feed animals well nowadays, when feeding-stuff is so hard to get.

We milk producers had lately received two letters from the Minister of Agriculture, asking us to try and increase our milk production, but the speaker was afraid it was too late to do anything in the matter now, and that there would be a great shortage of milk next winter. His predecessor ought to have sent out the letter two years and nine months ago.

Another difficulty which dairy farmers had to face these days was that young people were not animal-minded, and though they loved anything to say to a tractor, they did not much take to milking cows, which was a seven day a week job."

Yours faithfully,

Clifford Manor, Graham Rees-Mogg.
Stratford-on-Avon.
June 2nd, 1942.

CASTOR SEED POISONING, OR "COLDSTRUCK PARALYSIS" IN THE CAMEL?

Sir,—In your issue of May 9th, Mr. Peck reports on a camel "case" which he described as one of castor seed poisoning. I hardly think the diagnosis is justified merely because a few castor-oil seeds were recovered by gastric lavage. In other animals, castor seed poisoning is of slow onset with symptoms of irritation of stomach and intestines; this animal, however, appears to have been noticed ill soon after eating the plant and with marked nervous derangement. Those nervous symptoms seem typical of that seizure of doubtful aetiology which is fully described on pp. 327-330 of my book under the provisional name "Coldstruck Paralysis," but Mr. Peck had the pleasure of seeing a quicker recovery than is usual in that disease. He began his medicinal treatment with arecoline, eserine and strychnine, three times in ½-hour. He did not get the rapid purgation he was aiming at, but eserine acts strongly on voluntary muscles in the camel (see p. 155 of my book) and I think by a lucky accident he has found a better treatment for "Coldstruck" than we have yet had. If I were still "in the camel business," I should certainly give eserine a trial in that disease after reading Mr. Peck's report.

In the interests of precise reporting, may I object to "the skin over the face twitched"; surely it was the facial muscles that did this?

Mr. Peck's reported experiences will always be of interest to me, but I could wish that *The Veterinary Record* might be produced at half its present price or less, that it might be more veterinary and less agricultural, and that clinical reports might be its main feature so that the clinical art would be better served.

Yours truly,

Arnold S. Leese, M.R.C.V.S.

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THE PROFESSION AND PUBLICITY

Sir,—Have we determined exactly what we mean to gain by a publicity campaign? Is it part of an effort to help the war by, to put it bluntly, selling our products like any commercial concern? Or the first step towards gaining those powers which are our right by virtue of our education and training? The medical profession controls all those lay services, such as midwifery and meat inspection, which in any way reflect upon the health of the human subject. Should we not also supervise and direct those lay services which in any way have to do with livestock? For example, county dairy officers and dairy bacteriologists are responsible only to senior agriculturists who do not possess our knowledge. Yet such services impinge at many points on questions of health and disease; and in order to qualify for such posts, the holder has first by law to receive a training in animal anatomy, physiology, and preventive medicine from a veterinary education officer. The veterinary education officer is appointed to train such students, but has no check over their activities once they have obtained their diplomas; he may even find them appointed to positions where, as in the writer's experience, their word is accepted before his. Thus such anomalies occur that a dairy bacteriologist, ignorant of both the latest technique of mastitis bacteriology and of all the allied questions involved, declares a herd to be free of the disease, thereby, perhaps, confounding the county dairy officer, who, also without the information required, is at a loss to account for a steady drop in milk yield and loss of cheese-making properties in the milk.

Could not the first-year veterinary student study at an agricultural centre, taking with the agricultural students the lectures in biology and chemistry which form the base of all courses, and also those on animal husbandry, etc., and receiving at the end of the year a certificate in simple agriculture, akin to the agricultural certificate issued to farmers' sons who have not the time to take the longer education required for the National Diplomas in Agriculture, Dairying, and Poultry Husbandry? Veterinary students who wished, might take a further course, in the same manner as they now take the degree of Bachelor of Science, which would fit them to take a modified form of one of the National Diplomas. Thus all veterinary students would have received an introduction to animal management which would do much to solve the present vexed question of their competence on qualification. And at the same time some of them would be qualified to supervise the duties of lay workers.

Yours faithfully,

Ernest Gray.

Barn Hill,
Thurston,
Bury St. Edmunds,
Suffolk.

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SPECIALISATION OF THE VETERINARY PROFESSION

Sir,—In your issue of May 23rd, 1942, Dr. W. L. Williams, of New York, introduces yet another important proposition which is regarded as of much significance by practitioners and laboratory workers who are anxious about the future of the veterinary profession. I am referring to his suggestion that a central agency should be formed in which rarities such as monstrosities could be studied; it is possible that it will be read with interest by many readers, but highly improbable that it will ever be taken seriously or put to any practical use. So also with so many other suggestions which appear each week in the *Record*. Does this not point to the fact that *there is not nearly enough specialisation in the veterinary profession*?

Take, for example, the ordinary practitioner who is called in to treat a cow for infertility. He will squeeze the ovaries (if he can find them) and irrigate the uterus and vagina to the best of his ability. Does he know what he is doing? Does he realise what damage he might cause to the delicate ovaries or the closely related Fallopian tubes? How many practitioners have actually seen or handled the ovary in its various stages of development—at the local slaughterhouse or knacker's yard? In this single case there are innumerable other details which are never even given consideration. You cannot blame the practitioner. He has no time to attend to the little idiosyncrasies of a particular animal; and for the same reason he seldom goes back to give it a second treatment or even an examination.

The majority of large-animal practitioners have a few small animals at least to attend. This is decidedly wrong, as their methods of treatment and supervision of one animal or the other are bound to suffer or become irrational—due to the fact that very few men have the capacity to cope with a horse practice, bovine medicine, surgery, obstetrics and sterility, swine and sheep diseases, plus a dog and cat practice. Many of these practitioners have to perform tuberculin testing and other Ministry work on top of all this; and the result is an inevitable rush each day.

The medical profession gives us an example of the specialised duties which will ultimately be applied in a similar manner to that of the apparently less aspiring veterinarians. Is there no body or committee in Great Britain who will recognise the importance of training the newly-qualified men in the more important branches of veterinary science, instead of allowing them to drift into the ways of the past?

Yours faithfully,

James K. L. Pearson.
(Final Year.)

Glasgow Veterinary College,
83, Buccleuch Street,
Glasgow, C.3.
June 1st, 1942.

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COMPETENCE OF THE NEWLY-QUALIFIED

Sir,—Mr. E. J. Roberts has asked how some of the older veterinary surgeons gained experience. I always like to try and help striving graduates and in this connection appreciate the experiences of some of the ladies in the profession, as related in your columns. I esteem Mr. Roberts's query, and will give shortly my own experiences, which may help.

1. Because there were 11 boys and one girl in our family, I considered we were too thick on the ground, and to make room for some of the rest I cleared out.

2. My father and uncles kept 20 horses and 4 cows. I visited them daily and thus came in contact with our veterinary surgeon—a worthy gentleman, Mr. J. B. Taylor, of Ashton-under-Lyne—and was a pupil with him for about eight months.

3. I was afterwards a pupil with Mr. Telbar Hopkin in Manchester.

4. I then went as pupil with Mr. E. P. Edwards, of Mold.

To all these gentlemen premiums were paid, because I thought it right and proper that this should be done.

5. I qualified after some trouble, especially with my first examination, because I had been five years in another occupation after leaving Tattenhall College. My first vacation was spent with Messrs. Shorten and Phillips, of Ipswich.

6. I began to make a little money after qualifying. I was married and worked for 13 years in the City of Norwich in the Cattle Market, many a time taking the full charge of a big practice and shoeing forge (with three fires) under Mr. W. F. Howes, a good surgeon and kind and broad-minded principal.

7. I then came to Bolton. I have been here 32 years and have always managed to earn a living.

8. As a young man I rode horseback every week; took interest in sport of all kinds; gave first-aid to the firm's horses and cows, and even doctored the family dog.

Thus ends the lesson.

Yours faithfully,

G. Mayall.

Bolton.